PHYSICS ABSTRACTS

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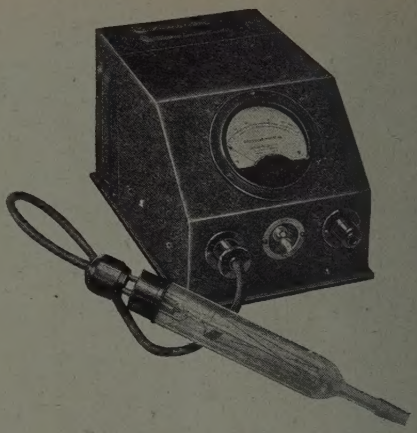

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ASTRONOMY

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Radiation pressure in the point-source stellar model. HENRICH, L. R. *Astrophys. J.*, 96, *pp.* 106–123, *July*, 1942.—[See Abstr. 1493 (1941)]. The effect of radiation pressure in a point-source stellar model is investigated. Envelopes in radiative equilibrium with the opacity following a corrected Kramers law are fitted to cores in convective equilibrium for 4 different values of the ratio of radiation pressure to gas pressure at the centre. The theoretical mass-luminosity-radius relation is obtained and is applied to determine the H content of a few stars.

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Theoretical properties of dense hydrogen. CRITCHFIELD, C. L. *Astrophys. J.*, 96, *pp.* 1–10, *July*, 1942.—A large part of a giant planet may be composed of H which is under sufficient pressure to form the metallic phase. The thermal conductivity calculated for that phase is high enough to carry away a reasonable amount of heat due to radioactivity of the core without raising the internal temperature above the m.p. of the lattice. An upper limit to the density of pure H is set by the formation of deuterons from neighbouring protons. It is shown that the internal temperature of a white dwarf star in which the H lies on the surface will not be very different from that found for uniformly mixed material. The main source of opacity of atomic H on the surface is absorption during triple collisions.

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The equilibrium of a perfect compressible fluid configuration. KROGDAHL, W. *Astrophys. J.*, 96, *pp.* 124–150, *July*, 1942.—The equilibrium of a perfect compressible fluid configuration is considered, and the equations for the perturbations induced by rotational and/or tidal forces are derived. The results are obtained in a sufficiently general form to be applicable to any model and are simple generalizations of what is already known for polytropes. Numerical application is made to 3 non-polytropic models.

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A note on the perturbation theory for distorted stellar configurations. CHANDRASEKHAR, S., AND KROGDAHL, W. *Astrophys. J.*, 96, *pp.* 151–154, *July*, 1942.—The general perturbation theory [Abstr. 2974 (1942)] is related to the earlier discussion [Abstr. 2399 (1939)].

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A mathematical formula for meteoritic age-determination and its application to the Pultusk, Poland, meteorites. PAZ, L. LA. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 274–278, 1941.—The author explains the low values found in recent He-content determinations of

the age of the Pultusk meteorites by Corlin's hypothesis [Abstr. 1533 (1939)] that meteorites originate in the electrostatic accumulation of particles in interstellar space. Various assumptions regarding the average recovered mass of the meteorites and the corresponding percentage ablation suffered during their passage through the atmosphere lead to fair agreement between the age so derived and the He-content value. A. HU.

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Distortions caused by the finite transmission width physical apparatus with application to periodicity search. MEYER-EPPLER, W. *Ann. Phys., Lpz.*, , 4, *pp.* 261–300, 1942.—By means of the Fourier ansform a survey is made of the phenomena ising in the elimination of energy distributions, i.e. the formation of the mean value over a finite space time interval in the measurement of varying hysical processes, such as spectral intensities pectroscopic apparatus, acoustic and electric filters) photographic and stroboscopic measurements, optical projection, sound films, etc. The theory of elimination of energy distributions is discussed. Symmetrical apparatus functions with their pertinent spectra, unsymmetrical apparatus functions with their spectra represented in the form of loci, spectral functions with zero positions and multiple elimination, are included with diagrams and illustrations. The physical methods of representing spectral functions by (*a*) the movable hyperbolic raster and (*b*) the projection periodograph are dealt with, and spectra taken with them are reproduced in illustration. It is pointed out that for the solution of periodic structures apparatus functions typified by an error distribution curve are favourable, whereas apparatus functions of the form of a rectangular or round diaphragm, which occur in many physical measurements, are unfavourable in this respect. [Abstr. 3037 (1942)]. H. G. S.

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See Abstr. 2997 530.12 : 531.51

2994 530.145.63

A practical method for the solution of certain problems in quantum mechanics by successive removal of terms from the Hamiltonian by contact transformations of the dynamical variables. I. General theory. II. Power series in a co-ordinate and its conjugate momentum. The anharmonic oscillator by perturbation theory. THOMAS, L. H. *J. Chem. Phys.*, 10, *pp.* 532–545, *Aug.*, 1942.—Problems in quantum mechanics may be solved by canonical change of the representation in terms of which the dynamical variables are expressed. They may also be solved by contact transformations of the dynamical variables. The usual notation is modified slightly to make it more convenient for developing these methods. Their parallel development shows their essential equivalence but formal difference. The non-commutative algebra of polynomials in a co-ordinate and its conjugate momentum is reduced to common algebra by Weyl's method, and tables are given for facilitating its use. It is shown how the problem of the anharmonic oscillator can be solved by contact transformations, and tables are given for removing terms up to the third degree in its co-ordinate and momentum and for finding the modified Hamiltonian up to the fourth degree.

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Statistical distribution laws for rate processes. II. Non-uniform distributions. LONGTIN, B. *J. Chem. Phys.*, 10, *pp.* 546–556, *Aug.*, 1942.—A re-examination of the fundamental hypotheses of statistical mechanics shows that the principle of the most probable distribution may be interpreted in such a way as to be applicable as well to systems which are not at equilibrium. The general method of deriving distribution laws for systems not at equilibrium is outlined. The use of this method is illustrated by deriving a general distribution law for systems in which the velocities are required to be non-Maxwellian. The distribution of velocities of molecules in any group having a specified average velocity is Maxwellian relative to the group average velocity. The average total energy

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See Abstr. 2997 530.12 : 531.51

2994 530.145.63

A practical method for the solution of certain problems in quantum mechanics by successive removal of terms from the Hamiltonian by contact transformations of the dynamical variables. I. General theory. II. Power series in a co-ordinate and its conjugate momentum. The anharmonic oscillator by perturbation theory. THOMAS, L. H. *J. Chem. Phys.*, 10, *pp.* 532–545, *Aug.*, 1942.—Problems in quantum mechanics may be solved by canonical change of the representation in terms of which the dynamical variables are expressed. They may also be solved by contact transformations of the dynamical variables. The usual notation is modified slightly to make it more convenient for developing these methods. Their parallel development shows their essential equivalence but formal difference. The non-commutative algebra of polynomials in a co-ordinate and its conjugate momentum is reduced to common algebra by Weyl's method, and tables are given for facilitating its use. It is shown how the problem of the anharmonic oscillator can be solved by contact transformations, and tables are given for removing terms up to the third degree in its co-ordinate and momentum and for finding the modified Hamiltonian up to the fourth degree.

2995 531.19

Statistical distribution laws for rate processes. II. Non-uniform distributions. LONGTIN, B. *J. Chem. Phys.*, 10, *pp.* 546–556, *Aug.*, 1942.—A re-examination of the fundamental hypotheses of statistical mechanics shows that the principle of the most probable distribution may be interpreted in such a way as to be applicable as well to systems which are not at equilibrium. The general method of deriving distribution laws for systems not at equilibrium is outlined. The use of this method is illustrated by deriving a general distribution law for systems in which the velocities are required to be non-Maxwellian. The distribution of velocities of molecules in any group having a specified average velocity is Maxwellian relative to the group average velocity. The average total energy

of such a system is shown to be the sum of the kinetic energies of mass motion of the several groups of molecules plus the Maxwellian average energy corresponding to the given volume and temperature. The methods are used to determine the most general form of statistical distribution law suitable for the treatment of rate processes. Various special forms of the distribution law result from different ways of expressing the rate variables and experimental conditions.

2996 531.383

A gyroscope experiment for the dynamics laboratory. BARTUNEK, P. F. *Amer. J. Phys.*, 10, *pp.* 189–190, *Aug.*, 1942.

2997 531.51 : 530.12

Demonstration of the non-existence of gravitational fields with a non-vanishing total mass free of singularities. EINSTEIN, A. *Rev. Univ. Tucumán A*, 2, *pp.* 11–15, *Dec.*, 1941.—It is proved that there does not exist a solution of the gravitational equations of general relativity which represents a particle of finite non-zero mass and which has no singularities. Fields infinitely close to Euclidean fields are considered and it is proved, with the help of Gauss' theorem, that 2 infinitely close solutions without singularities have the same total mass. But by considering the "similar" solutions of the gravitational equations it may be proved that 2 such inf. close solutions must have different masses. This contradiction implies that there can be no solution free of singularities corresp. to a particle of total mass $\gtrless 0$. G. C. McV.

2998 531.55

A large-scale demonstration of the flight of projectiles. HENRY, G. *Amer. J. Phys.*, 10, *pp.* 202–203, *Aug.*, 1942.

2999 $531.555 = 3$

Explicit ballistic temperature effect. KIHM, O., AND SÄNGER, R. *Schweiz. Arch. angew. Wiss. Techn.*, 8, *pp.* 167–169, *June*, 1942.—Following on previous work [Abstr. 1977 (1941)] the authors investigate the effect of temperature disturbances on the speed of sound and the air-resistance function. The changes in the elements of a trajectory due to this cause are designated as "explicit." Starting by transforming temperature change into a corresponding density change, a function is obtained which, by Dufresnois' method, enables explicit temperature disturbances to be dealt with in the same way as disturbances in density. Particular cases are cited. G. E. A.

3000 531.561

Baseballs *do* curve *and* drop! SUTTON, R. M. *Amer. J. Phys.*, 10, *pp.* 201–202, *Aug.*, 1942.

See Abstr. 3102 531.71 : 677.3 : 539.216.1

3001 531.713

Optical comparators. *J. Sci. Instrum.*, 19, *pp.* 141–142, *Sept.*, 1942.—2 models of the "optigage" are described. Both are for direct visual comparison of work with a standard, employing mech. and optical magnification. In one model the magnification is $\times$ 1 000, with a range of 0·001 in.; estimations to within 0·00002 in. are claimed. The 2nd model has a magnification of $\times$ 100, with a scale of $\pm$ 0·01 in., allowing estimations to 0·0001 in. A pivoted lever engages a fixed prism, rotation of which is shown optically. Drgs. and details are given. E. H. W. B.

3002 532.13

The velocity-gradient method for the measureme of viscous properties of non-Newtonian liquids. MU HERJEE, J. N., AND GUPTA, N. C. S. *Indian J. Phys* 16, *pp.* 49–52, *Feb.*, 1942.—A method is described direct measurement of velocities at different depth in a flowing liquid. The liquid is contained in rectangular cell of depth of the order of 1 mm. a the velocities measured with a microscope using objective with a large working distance. Velocit distribution curves are obtained with a sugar solutio 2 gelatin sols and a bentonite suspension. T advantages of the method are discussed.

3003 532.13 : 532.63 : 536.222 : 536.483

Heat transfer and superfluidity of helium II. KAPITZ P. L. *J. Phys., U.S.S.R.*, 5, 1, *pp.* 59–69, 1941.— is shown that, when He is forced to flow und pressure through a slit, a temperature difference set up $\propto$ the pressure. The thermodynamic rever bility of this thermo-hydrodynamic phenomenon He II is confirmed, and it is suggested that the phen menon provides a powerful method of attaining ve low temperatures. Work in this direction has co menced, and, using a specially constructed pump force liquid He through a porous plug, a temperatu drop of 0·4 deg. K. has been obtained. It is thoug that, unless unforeseen changes occur in the properti of He II, the approach to abs. zero should only limited by the technical difficulties of developing t method. R. W.

See Abstr. 3013 532.13 : 536.76 : 532.62

3004 532.13 : 541.18.025

Methods of measuring yield value, viscosity a thixotropy. MUKHERJEE, J. N., GUPTA, N. C. S., A SEN, K. C. *Indian J. Phys.*, 16, *pp.* 54–65, *Fe* 1942.—The capillary and the rotary viscometer not give the same Bingham yield value and viscos for bentonite suspensions. A direct method using rectangular flat cell for measuring the veloc gradient along the normal during flow has be developed, which is expected to give yield value a viscosity in abs. units. Values obtained by t velocity-gradient method are more in accord wi those obtained by the rotary viscometer than th obtained by the capillary viscometer. Variations both the lower yield value and the apparent viscos of thixotropic suspensions with time have be observed. Compared with the apparent viscosi the lower yield value appears to give a better meas of the rate of thixotropic gelation.

See Abstr. 3128 532.13 : 541.182

See Abstr. 3129 532.13 : 541.182.021

3005 532.137

A simple rotary viscometer for the study of anom ous viscous properties. MUKHERJEE, J. N., A GUPTA, N. C. S. *Indian J. Phys.*, 16, *pp.* 66–70, *Fe* 1942.—A simple rotary viscometer suitable for t study of "anomalous" viscous properties is describ It admits of easy end correction, and there is no s at the metal walls with sugar and glycerine solutio Consistency curves of bentonite suspension, gela sol and starch paste, representing plastic, structu viscous and dilatant systems, respectively, are tained.

3006 532.14
The densities of some aliphatic amines. SWIFT, E. *J. Amer. Chem. Soc.*, 64, *pp.* 115–116, *Jan.*, 42.—The densities under saturation pressure of arefully purified aliphatic amines have been deter-ned with a precision of 0·01% from 0° to 35°.

3007 532.14
Note on the specific gravity of sodium dichromate utions. ALTIMIER, D. F. *J. Amer. Chem. Soc.*, 64, 175–176, *Jan.*, 1942.

3008 532.516
The influence of temperature on boundary lubrica-n. FREWING, J. J. *Proc. Roy. Soc. A*, 181, 23–42, *Sept.* 24, 1942.—The frictional behaviour ween mild-steel surfaces lubricated with excess of re hydrocarbons, ketones, alcohols, amides, acids d esters has been investigated at low speeds and der high loads. In all cases a transition from ooth sliding to irregular stick and slip motion takes ace at a temperature characteristic of the lubricant ployed. Experiments in which lubricant films e or more molecules thick were built up by the ngmuir–Blodgett technique show that the transi-n from smooth sliding to stickslips occurs when e adsorbed surface film of lubricant breaks down d becomes disoriented. Acids and esters are ongly adsorbed, while hydrocarbons, ketones, ohols and amides are not appreciably adsorbed. dsorption of acids and esters occurs by the inter-tion of the dipoles in their polar group with the tal atoms in the surface. Molecules of long-chain mpounds are oriented on a metal surface in the same y as on an aqueous surface. Measurement of the eff. of friction between surfaces lubricated with ms one and many molecules thick shows that, under nditions of "boundary lubrication" prevailing at gh loads and low speeds, excess of lubricant is ueezed out, and lubrication is effected by a uni-olecular film adsorbed on each surface. The riation of the coeff. of friction with load in the case oleic acid shows that orientation with this lubricant tends beyond the primary adsorbed layer.

3009 532.593
On the generation of waves on shallow water by nd. BONDI, H. *Proc. Roy. Soc. A*, 181, *pp.* 67–71, *pt.* 24, 1942.—Jeffreys' theory of the formation of ater waves is amplified by adding a term for the ssipation in the boundary layer. Considerations of nergy lead to an inequality from which values are erived for the min. wind velocity necessary to excite aves and for the length of the waves thus generated.

3010 532.596
A derivation of the tidal equations. JEFFREYS, H. *roc. Roy. Soc. A*, 181, *pp.* 20–22, *Sept.* 24, 1942.—See Abstr. 1245 (1942)].

3011 532.61.08
Film balance as an analytical tool for biological and od research. BOYD, G. E., AND HARKINS, W. D. *ndustr. Engng Chem. (Analyt. Edit.)*, 14, *pp.* 496–502, *une* 15, 1942.—The vertical and horizontal types of lm balance can be used in combination with a surface ough. A detailed description and theoretical dis-ussion are given of the vertical type and the tech-ique of its use, with accessories such as the dark-eld ultra-microscope and cardioid condenser, and apparatus for the determination of surface potential and surface viscosity. Surface films may be used to detect traces of insoluble organic substances and to identify unknown compounds; film pressure/area data are often decisive in the proof of complex organic mol. structure. Uses are illustrated by descriptions of applications to various problems. N. M. B.

3012 532.614 : 536.658
Relationships between the spreading pressure, adsorption and wetting. ROWLEY, H. H., AND INNES, W. B. *J. Phys. Chem.*, 46, *pp.* 694–705, *June*, 1942.—A method of approach in the thermodynamic treatment of multi-layers is suggested. The concept of condensed multi-layers is untenable from the standpoint of the 2-dimensional phase rule when the adsorption isotherm has a sigmoid shape. The total spreading pressure is subdivided into that due to the first layer, that due to succeeding layers at pressures $<$ saturation, and that due to succeeding layers at pressures $>$ saturation. The idea that the contact angle of a liquid phase with a solid is determined by the reversible work of wetting of the adsorbed layer rather than of the solid itself is in harmony with other facts. Reasons for justifying the hypothesis that the interfacial contact angle of 2 immiscible liquids with a solid is determined by the reversible work of wetting a single adsorbed phase are given. Modifications of the treatment for plane surfaces are suggested for capillary systems. Values of F^1 (the spreading pressure of the first layer when equilibrium exists between this phase and a 3-dimensional liquid and vapour phase) have been calculated for a number of organic compounds adsorbed on charcoal.

3013 532.62 : 536.76 : 532.13
A superliquid in two dimensions and a first-order change in a condensed monolayer. II. Abnormal viscosity relations of alcohol monolayers in condensed liquid phases. COPELAND, L. E., HARKINS, W. D., AND BOYD, G. E. *J. Chem. Phys.*, 10, *pp.* 357–365, *June*, 1942.—This paper continues the earlier work [Abstr. 2541 (1942)] and investigates the abnormal viscosity relations of alcohol monolayers in condensed liquid phases. It is found that the new phase in alcohol monolayers has the compressibility of a solid, and, at temperatures near that of the first-order transition, the low viscosity of a very highly fluid liquid. The viscosity is almost independent of pressure, but varies in an abnormal way with temperature, e.g. octadecanol exhibits a min. viscosity at about 8·8°C. The paper includes an investigation of the general viscosity relations of condensed monolayers, of the abnormal variation of the viscosity of a liquid condensed phase of an alcohol with temperature and with pressure, of a superliquid phase with extremely abnormal viscosity relations, of phase transitions as revealed by abrupt changes in viscosity, and of abnormal viscosity relations of monolayers of eicosanol. To explain the results, it is necessary to assume a type of bonding which is extremely sensitive to changes of intermolecular distance, and while H bonding is likely to be involved, a decision is postponed for further data. H. H. HO.

3014 532.623
Time of collapse of spherical soap bubbles. VENKATESHA, S. *J. Mysore Univ. B*, 3, 3, *pp.* 13–17, 1942.—

Sibaiya's deduction (unpublished) is outlined for the time of deflation and disappearance of a spherical soap bubble blown at the end of a uniform glass tube. If τ = time of collapse, η = viscosity of the moist gas within the bubble, T = surface tension of the soap solution, R = initial radius of bubble, l = length of tube, and a = its internal radius, then $R^4/\tau = Ta^4/2\eta l$. Data are tabulated in support of this formula for bubbles blown with and in air, O_2 and C_2H_2. N. M. B.

See Abstr. 3003 532.63 : 536.222 : 536.483 : 532.13

See Abstr. 3018 532.77 : 534.213

3015 533.15

The thermal diffusion of radon gas mixtures. HARRISON, G. E. *Proc. Roy. Soc. A*, 181, *pp.* 93–100, *Sept.* 24, 1942.—In continuation of earlier experiments [Abstr. 2928 (1937)] the thermal diffusion of mixtures of radon-neon and radon-argon is studied. In order to calculate the repulsive-force field between these two pairs of molecules, the present results were combined with measurements of ordinary diffusion of radon into neon and radon into argon, and viscosity determinations at various temperatures of neon and argon. Radon-argon molecules are the closest approach to the Maxwellian case yet studied experimentally.

SOUND. VIBRATIONS

3016 534.13

Acoustic properties of small cavities. SABINE, P. E. *J. Acoust. Soc. Amer.*, 14, *pp.* 74–78, *July*, 1942.—The small cavities were apertured spaces of 1 in. dia. and of depths from $\frac{5}{32}$ to $\frac{21}{32}$ in., and were made in a baffle of plaster of Paris 5½ in. dia. and 1 in. thick. Sound from a loud-speaker of given frequency and level was directed to the baffle at 39 in. distance, and the effect of hole depth (t), hole radius (r) and cavity volume (V) on the acoustic pressure developed within the cavity as compared with the pressure developed by the same sound level at the face of an un-apertured baffle was measured. The cavities show marked resonance characteristics with pressure-level increases of 20 db at resonance. For frequencies << resonance, pressures within the cavity do not differ markedly from those at the face of the unperforated baffle. For frequencies >> resonance there is a marked pressure attenuation within the cavity. The effect is shown in graphs, and the frequency for peak response varies linearly with $1/\sqrt{V}$, inversely with $\sqrt{t}$, and almost linearly with r. The investigation throws light on the acoustical behaviour of hearing aids. G. E. A.

3017 534.141.4 : 788.1

An experimental study of trumpet embouchure. HENDERSON, H. W. *J. Acoust. Soc. Amer.*, 14, *pp.* 58–64, *July*, 1942.—A study to determine the most efficient lip technique for producing trumpet tone. From experiments it is concluded that the tones are originated by the upper lip vibrating as a single reed against the lower lip whose main functions are to provide something against which the upper lip can vibrate, and to control its vibration rate. Measurement and recording of mouthpiece pressure show that as higher tones are played there is a definite increase in pressure by all players. Mouthpiece pressure undesirable when it takes over what muscular tensio should do, and the ideal method is to use a uniforr low rate of pressure change throughout the trumpe range. G. E. A

3018 534.213 : 532.77

Propagation of ultrasonic waves in liquid mixture and intermolecular forces. II. PRASAD, R. *India J. Phys.*, 16, *pp.* 1–11, *Feb.*, 1942.—[See Abstr. 176 (1942)]. Considers the compressibility/concentratio curves of the liquids on the basis of intermolecula action. The following mixtures were studiec (1) Ethyl alcohol and benzene, (2) butyl alcohol an heptane, (3) benzene and carbon tetrachloride (4) ether and benzene, (5) ethyl acetate and carbo tetrachloride. In the case of alcohol and benzene the compressibility curve is inflected. The hig polarizability of benzene and the association-formin tendency of alcohol determines the nature of th curve. In butyl-alcohol–heptane, the inertness c heptane as contrasted with the activity of benzene i significant.

See Abstr. 3024 534.321.9 : 534.771

3019 534.373

Effect of depth of liquid on damping of a quart oscillator. KRISHNAN, K. G. *Indian J. Phys.*, 1(*pp.* 23–26, *Feb.*, 1942.—The paper describes th results obtained in the investigations of damping c h.f. sound waves at different depths of liquids. Ther is no definite dependence of the damping effect eithe on the hydrostatic pressure of the liquid or on th viscosity.

3020 534.41 : 621.395.623.7

Experiments with the noise-analysis method of loud speaker measurement. OLNEY, B. *J. Acoust. Soc Amer.*, 14, *pp.* 79–83, *July*, 1942.—The paper detail measurements and records of loud-speaker respons when continuous frequency-spectrum electrical inpu is applied. The noise-analysis method does no possess any unique advantage over other time averaging artifices aimed at discriminating agains room effects. When the analyser band is mad sufficiently wide to eliminate standing-wave effects the system is no longer capable of revealing shar irregularities in the loud-speaker response. The warble-tone method is much easier to practise an yields comparable results. Observations are mad on the reports of previous investigators. [Abstr. 373 (1939)]. G. E. A

3021 534.612 = 3

On the calculation of the sound field immediately in front of a circular diaphragm. STENZEL, H. *Ann Phys., Lpz.*, 41, 4, *pp.* 245–260, 1942.—Formula are derived for the sound pressure of the circula diaphragm at a point in its plane. Their suitability fo practical computations for diagrams of large radii i illustrated by examples for xa = 10, 20, 40 and 6 (a = radius of diaphragm, $x = 2\pi/\lambda$), and the result are represented graphically. H. G. S

3022 534.612 = 3

Absorption measurements of supersonic waves in electrolytic conducting solutions. RÜFER, W. *Ann Phys., Lpz.*, 41, 4, *pp.* 301–312, 1942.—Adapting previous methods [Abstr. 5011 (1938) and 2391 (1935)] the sound pressure is determined at different

ances from the source of the sound and the
f. of absorption deduced for H_2O, NaCl, NaBr,
r, $CaCl_2$, $MgCl_2$, $Cu(NO_3)_2$, CH_3COONa,
ClO_3, $NaClO_4$, $MgSO_4$, $CuSO_4$, Na_2SO_4, Na_3PO_4,
$Fe(CN)_6$, $K_2Cr_2O_7$, $K_2Sn(OH)_6$, $UO_2(NO_3)_2$ over
frequency range of 2 900–8 850 kc./sec. The
ults are collected in a table which gives the exp.
ues of α/ν^2 and deduced values for conc. of 10% and
ol/litre. The absorptions rel. to that of water are
n. H. G. S.

4023. 534.756

Damping and selectivity of the inner ear. Hunt, S. *J. Acoust. Soc. Amer.*, 14, *pp.* 50–57, *July*, 2.—A relation exists between damping and sharp-s of tuning, and it is shown that the curve of ampli-e of the basilar membrane (A_{bm}) against distance ng the membrane very nearly corresponds to the mula for 5 cascaded resonators. The ear does contain such a system, but if there existed some-ng in the nature of a radio-receiver a.v.c. in the which reduced the response of its resonators in portion to the log of the stimulus energy, the rela-n might be $d(\log S)/2d(\log A_{bm}) = R$, where S is ergy of stimulus and R is 5. It is concluded that ear contains a means of ensuring that A_{bm} has a ue about the 5th root of the value it would have no such system operated. It seems likely that the chlear response is a measure of the pressure at any nt in the cochlea, also the path: vestibule-gallery–licotrema–tympanic-gallery is the mechanical alogue of a negative feed-back circuit, and that a ocess of volume compression occurs with about a to 1 logarithmic ratio. The heavy negative feed-ck entails heavy damping. A consideration of ch shift caused by change in tension of the fibres nfirms the value 5 for R, and values found for A_{bm} e in fair accordance with those obtained from oustic-impedance measurements. G. E. A.

3024 534.771 : 534.321.9

Cochlear potentials elicited from bats by supersonic unds. Galambos, R. *J. Acoust. Soc. Amer.*, 14, 41–49, *July*, 1942.—Bats of 4 insectivorous species re anaesthetized with nembutal and subjected to personic sounds from a magnetostriction oscillator, Galton whistle or the cry of another bat. The ctric response of the bat cochlear was recorded by eans of a microvoltmeter sensitive to frequencies to 98 kc./s. The max. potential recorded was prox. const. between 40 and 50 kc./s. Cochlear otential for a given frequency increases with the tensity up to a certain critical intensity and there-ter diminishes for louder tones. With subsequent crease in intensity, the original potentials are not tained. This hysteresis effect is explained in terms the contraction of the intra-aural muscles of the iddle ear. The observations indicate that bats hear nes of frequencies up to at least 55 kc./s. G. E. A.

3025 534.78

The laryngeal ventricle considered as an acoustical ter. Pepinsky, A. *J. Acoust. Soc. Amer.*, 14, 32–35, *July*, 1942.—A survey of the anatomical nd physiological conditions involved in the structure the larynx and its ventricle. The ventricle is a ocket-shaped slit in the side walls of the larynx, hich extends laterally between the true and the false vocal cords, and the presence of fibrous tissue in the ventricle indicates the possibility of muscular control of its volume and the area of its orifice. The outlining of deep structures by X-rays has confirmed the important part played by the ventricular bands in voice production. Possible effects of the ventricle on vocal tone quality are considered by regarding it as a l.f. pass filter. G. E. A.

3026 534.785

Some aspects of model larynx function. Carhart, R. *J. Acoust. Soc. Amer.*, 14, *pp.* 36–40, *July*, 1942.—An account of 4 studies of model larynges of the cushion-pipe variety in which the distance between the cushions, air stream pressure, length of supply tube and length of resonator above the cushions, were controlled. Adjustment of the supply tube exerts a critical influence on the frequency and amplitude of cushion vibration; the mode of vibration is complex and is affected by supply tube adjustment; sound initiation within the model larynx is of the puff tone rather than of the vortex tone variety; the acoustic spectra of the sounds emitted are harmonic, predominantly harmonic or predominantly inharmonic. The last type contains combination tone elements. G. E. A.

3027 534.838 = 3

Noise control in motor design. Hablützel, E. *Schweiz. Bauztg*, 119, *pp.* 258–261, *May* 30, 1942.—The paper describes the methods by which the noise problems occurring in Diesel-motor working are overcome. The frequency spectrum of the noise shows which parts of the noise are most troublesome. Knocking and the noise of starting are considered, but the usual source of loudest noise is the exhaust, and there is no universal means of damping exhaust noise. By far the most useful sound-quenching device is the change in sectional area in the silencer, and a multi-chambered silencer has been developed on the principle of the electrical filter, consisting of resonance chambers connected by short pipes. Low-pass and high-pass filters may be constructed, and an exhaust silencer has to combine the properties of both types. The Venturi nozzle is effective in air suction for damping medium and low frequencies. The isolation of the machine and its housing, in respect of transmitted vibrations, are also considered. G. E. A.

3028 534.87

A survey on air-raid alarm signals. Volkmann, J. E., and Graham, M. L. *J. Acoust. Soc. Amer.*, 14, *pp.* 1–9, *July*, 1942.—Account of an outdoor survey made in Indianapolis to find the best means for sending alarm signals over a city. A single source is ruled out, and air losses, background noise and other factors, make projection beyond 1 to 1·5 mile radius impractical for a single source. The basic sound level required by an observer may be set at 75 to 80 db above threshold for signal frequencies near 400. It is desirable to vary or warble the tone by $\pm$ 10% of its fundamental frequency at 4 to 6 c./s. For 1 mile projection radius a source at a ht. of 100 ft. must have a strength of 132 db and, with a 60° distribution angle, should be rotated at 4 to 6 r.p.m. G. E. A.

3029 534.87

Air-raid siren field tests. Ball, L. M. *J. Acoust. Soc. Amer.*, 14, *pp.* 10–13, *July*, 1942.—Source

strength of sounder is defined as db at 100 ft. from source, signal level as db at distance D from source, and attenuation factor α as the nbr. of db by which the signal level is reduced each time the distance from the source is doubled. A test made in Detroit under favourable height conditions with a 135 db. siren gave $\alpha = 6$, or the same as would be derived from the inverse square law; over rolling ground with tall grass α was about 8, and in cities α was 9 to 11. The effective radius for 135 db sirens is about 1 mile in business sections and 1½ miles in residential sections. G. E. A.

OPTICS

3030 535.1 : 535.51

A new calculus for the treatment of optical systems. IV. JONES, R. C. *J. Opt. Soc. Amer.*, 32, *pp.* 486–493, *Aug.*, 1942.—Some additions to the general theory [Abstr. 2083 (1941)] and the derivation of matrices representing 2 optical elements are given: (1) plates possessing circular dichroism, and (2) plates cut from crystals of such low symmetry that the principal axes of absorption and refraction are not parallel. In case (2), the discussion is limited to monoclinic and triclinic crystals which do not possess optical activity.

3031 535.13 = 3

Bringing the electromagnetic theory of reflection and refraction into conformity with the physical processes. A corrigendum. SCHRIEVER, O. *Ann. Phys., Lpz.*, 41, 4, *p.* 324, 1942.—The observations on damping [Abstr. 1517 (1942)] are shown to be untenable. A further article is to be published. H. G. S.

See Abstr. 3076 535.234 : 537.533.79

3032 535.237 : 518.3

A six-place table of the Einstein functions. SHERMAN, J., AND EWELL, R. B. *J. Phys. Chem.*, 46, *pp.* 641–662, *June*, 1942.

3033 535.24 = 3

Models of photometric receiving systems exhibiting deviations from the laws of linearity and uniqueness. KÖNIG, H. *Helv. Phys. Acta*, 15, 1, *pp.* 85–107, 1942.—In working with the quantity "photometric brightness," certain axioms about the process of photometric matching are implied. The author states these, shows that they are not all independent and considers possible systems in which one or two or more of the axioms is false. The theoretical models illustrating these systems are obtained by imagining a visibility function $V(\lambda)$ of the form $\rho r(\lambda) + \gamma g(\lambda) + \beta b(\lambda)$ where ρ, γ and β are various functions of the stimuli on the 2 sides of the photometric matching field. Applied to the human eye, the theory leads to conclusions on the method of selecting photometrically "sound" observers. W. S. S.

See Abstr. 3073 535.3 : 537.531

See Abstr. 2961 535.3 : 548 : 537.531 : 513.734.6

3034 535.31

A long optical path in a restricted space. KRATZ, H. R., AND MACK, J. E. *J. Opt. Soc. Amer.*, 32, *pp.* 457–464, *Aug.*, 1942.—An instrument is described for attaining a long optical path by repeated traversal between a concave spherical mirror and a totally reflecting prism. Its properties are outlined and compared with those of other devices for similar purposes. The number of traversals is in principle unlimited but the angular spread of the final beam is less than that of the first traversal. The final image which is almost free of aberration, is as large and almost as bright as the source. The optics of the instrument is considered in detail.

3035 535.312 : 539.23

On a comparative study of the reflectivities of aluminium and silver films. RAMAKRISHNAN, M. V. *Indian J. Phys.*, 16, *pp.* 12–22, *Feb.*, 1942.—A comparative study of evaporated Al films with that of chemically deposited and sputtered Ag films is given. The reflectivity in the visible, near infra-red and ultraviolet part of the spectrum is discussed at length and the deterioration of Ag films with time is shown. Methods of preparing the respective films are also given.

3036 535.321

Testing and accurate use of Abbe-type refractometers. TILTON, L. W. *J. Opt. Soc. Amer.*, 32, *pp.* 371–381, *July*, 1942.

3037 535.33 = 3

Contributions to the problem of the reduction to zero slit width. MEYER-EPPLER, W. *Z. Instrumkde*, 60, *pp.* 197–209, 1940.—The problem of calculating and eliminating the impurity of the spectrum in spectroscopic apparatus due to the finite width of the slit is dealt with. [See Abstr. 2992 (1942)]. H. G.

3038 535.331

Direct spectrographic determination of copper and manganese in dyestuffs. BUC, G. L., ROYER, G. L. AND NORTON, A. R. *J. Opt. Soc. Amer.*, 32, *pp.* 454, 456, *Aug.*, 1942.

3039 535.338.3

The spectrum of chlorine I. GREEN, J. B., AND LYNN, J. T. *Phys. Rev.*, 62, *p.* 179, *Aug.* 1 *and* 15, 1942.

3040 535.338.33

Spectral structure and ionization potential of gadolinium I. RUSSELL, H. N. *Astrophys. J.*, 96, *pp.* 11–14, *July*, 1942.—The anticipated terms of multiplicity 11, $^{11}P^{11}D^{11}F$ (combining with a higher $^{11}D^0$), and also slightly higher $^9D^0$ and $^9S^0$ terms have been identified in Gd I. From these, the first ionization potential is found to be 6·16 V. The lowest configuration in Gd II is $4f^76s5d^{10}D^0$ is confirmed. The terms $4f^76s^2\,{}^8S^0$ probably lie about 0·5 V higher.

3041 535.338.4

Band spectrum of bismuth monochloride. RAY, S. K. *Indian J. Phys.*, 16, *pp.* 35–48, *Feb.*, 1942.—The spectrum was photographed both in emission and in absorption. A number of new bands has been discovered and is found to form a part of the existing less refrangible system of BiCl. The correctness of the vibrational analysis of Morgan for the 2-band systems of BiCl is confirmed.

3042 535.343

The absorption spectra of para- and diamagnetic nickel complexes. MILLS, J. E., AND MELLOR, D. P. *J. Amer. Chem. Soc.*, 64, *pp.* 181–182, *Jan.*, 1942.

3043 535.343

The absorption spectra of CdF and SnCl. FOWLER, JR., C. A. *Phys. Rev.*, 62, *pp.* 141–143, *Aug.* 1 *and* 15

1942.—CdF, vaporized in an electric furnace, shows no absorption in the region $\lambda\lambda$1 950–7 000 below 1 350°C., but above this temperature a band system appears at $\lambda\lambda$2 716–2 924. Strong continuous absorption is observed at higher temperatures. The spectrum of SnCl is photographed in absorption for the first time. The spectrum consists of the 2 band systems observed in emission, a new system in the farther ultra-violet, and 2 continua.

3044 535.343

The vibration-rotation spectrum of SiH_4. TINDAL, C. H., STRALEY, J. W., AND NIELSEN, H. H. *Phys. Rev.*, 62, *pp.* 151–160, *Aug.* 1 *and* 15, 1942.—The infra-red bands of SiH_4 have been remeasured at considerably higher resolving power. From a rotational analysis of the bands the equilibrium value of B and values of B for the vibration states v_2, v_3, v_4, $v_2 + v_3$ and $v_3 + v_4$, have been determined, B being $h/8\pi^2 Ic$. From the band centres the valence force constants are calculated.

3045 535.343

The vibration-rotation spectrum of GeH_4. STRALEY, J. W., TINDAL, C. H., AND NIELSEN, H. H. *Phys. Rev.*, 62, *pp.* 161–165, *Aug.* 1 *and* 15, 1942.—Two of the infra-red bands of SiH_4 have been remeasured at much increased resolving power. A new band near 13·0 μ has been located and measured. Four independent relations between the generalized valence force constants are computed.

3046 535.343

The near ultra-violet absorption spectrum of monodeuterobenzene. BECK, C. A., AND SPONER, H. *J. Chem. Phys.*, 10, *pp.* 575–581, *Sept.*, 1942.—The analysis of the ultra-violet absorption spectrum of monodeuterobenzene is given. The spectrum is, as in benzene, a forbidden transition which is made allowed by the 603 vibration corresponding to the 606 s^+ benzene vibration. The 0,0 band is calculated to be 38 124, and it occurs with extreme weakness.

3047 535.343 : 541.61 = 3

Considerations on the structure of imido-porphyrins in connection with phthalocyanines. ENDERMANN, F. *Z. phys. Chem. A*, 190, *pp.* 129–173, *Feb.*, 1942.—[See Abstr. 2334 (1941)]. The absorption spectra of imido-porphyrins and their Cu complex salts are discussed, and new structural formulae for these and for phthalocyanine are derived which are compatible with the results of X-ray analysis. R. N.

See Abstr. 3138, 3139 535.343 : 541.651

See Abstr. 3084 535.343 : 541.651 : 539.132

See Abstr. 3116 535.371 : 541.127

See Abstr. 3126 535.4 : 541.18

See Abstr. 3074 535.4 : 548 : 537.531

3048 535.415

Haidinger interferences in silvered mica. PFUND, A. H. *J. Opt. Soc. Amer.*, 32, *pp.* 383–387, *July*, 1942.—The Haidinger fringes obtained by passing convergent unpolarized light through a half-silvered mica plate consist of 2 superposed systems which near the centre of the pattern are polarized at rt. angles. The rings of the component systems are elliptical, but with different eccentricities, and together they give rise to a watered silk or *moiré* pattern. The *moiré* bands are related to the polarization bands shown by mica when examined between crossed polarizer and analyser. W. S. S.

3049 535.421

Determination of the wavelength of light by diffraction at grazing incidence. DITCHBURN, R. W. *Amer. J. Phys.*, 10, *pp.* 195–196, *Aug.*, 1942.

3050 535.43

Applications of wavelength turbidimetry in the infra-red. BARNETT, C. E. *J. Phys. Chem.*, 46, *pp.* 69–75, *Jan.*, 1942.—In recent work the spectral transmission curves of pigment particles in suspension have been extended into the infra-red (to about 4 μ). The author discusses the interpretation of the experimental curves in terms of the known laws of scattering of small particles and indicates how deductions about particle size characteristics can be drawn from the deviations from theoretical curves. Determinations of the infra-red transmission curve for different concentrations of the particles enable the refractive index of the particles to be roughly estimated. W. S. S.

3051 535.434

"Diffusing effect" of fog. MIDDLETON, W. E. K. *J. Opt. Soc. Amer.*, 32, *pp.* 139–143, *March*, 1942.—The author makes an approx. calculation of the variation of brightness across the edge of a black object seen against the sky in fog at a distance approaching the limit of visual range. The change from one brightness to the other is nearly complete in 1′ of arc; the total change in the next half deg. is < the contrast threshold for a sharp boundary and would almost certainly be inappreciable to the eye. The results give no support to the suggestion that there is a diffuse boundary in the sense used by Bennett and the author, and some other reason must be found for the high threshold of contrast necessary to reconcile observations in fog with the theory of visual range. W. S. S.

3052 535.434 : 541.8

A nephelometric method for determination of solubilities of extremely low order. DAVIS, W. W., AND PARKE, JR., T. V. *J. Amer. Chem. Soc.*, 64, *pp.* 101–107, *Jan.*, 1942.—A nephelometric method capable of measuring solubilities of polycyclic hydrocarbons to approx. 1 mg. is described. To illustrate the application the solubilities of 3,4-benzpyrene, 10-ethyl-1, 2-benzanthracene and phenanthrene, in pure water were determined.

See Abstr. 3147 535.434 : 541.8

See Abstr. 3030 535.51 : 535.1

3053 535.682 : 667.2

The colour changes of dyeings of vat and azoic dyes by wet and dry heat. KORNREICH, E. *J. Soc. Dy. Col., Bradford*, 58, *pp.* 177–184, *Sept.*, 1942.—On the evidence of phenomena of dispersion, aggregation, crystallization and hydration of vat and azoic dyes, it is suggested that the colour change, which dyeings of these dyes undergo as a result of the usual after-treatments with boiling soap solutions, is due to crystallization. The necessary preliminary to crystallization is dispersion and probably transitory hydration of the dye. In this way the vibration complex of the molecule is altered to an extent which is expressed in the colour change. Aggregation of the

crystalline particles gives rise to light-scattering phenomena which are confined to the dye in substance, but which play a part in the dyeing of regenerated cellulose. It is suggested that the colour changes produced by dry heat (ironing) and by absorption of moisture are due to dehydration and hydration, respectively, the sensitivity of a dye varying with the tendency of its particles to crystallize and to aggregate.

See Abstr. 3054 535.762 : 535.81

3054 535.81 : 535.762

Optical unit for obtaining variable magnification in ophthalmic use. OGLE, K. N. *J. Opt. Soc. Amer.*, 32, *pp.* 143–146, *March*, 1942.—The unit is designed as a "variable size lens" of zero power for use in studies of aniseiconia. It consists of a plus-minus combination in which the axial separation of the components can be varied continuously. Two types, one to give an overall magnification, the other to give magnification in one meridian, are described. Details are given of units which provide a range of magnification from -1% to $+4\%$ with a power error $< 0{\cdot}1\,D$ (distant vision) or $0{\cdot}01\,D$ (near vision). W. S. S.

3055 535.81 : 771.35

Lenses for aerial photography. KINGSLAKE, R. *J. Opt. Soc. Amer.*, 32, *pp.* 129–134, *March*, 1942.—Reviews the development of aerial photography from before 1914–18, with special reference to the lens, diagrams of the main types of the latter being reproduced. Since 1918, specialization on 3 distinct lines has taken place: lenses for military reconnaissance, lenses of high aperture for night photography, and wide-angle lenses for aerial surveying. W. S. S.

HEAT. THERMODYNAMICS

3056 536.212.3

Thermal insulation at very low temperatures. COOKE, A. H., AND HULL, R. A. *Proc. Roy. Soc. A*, 181, *pp.* 83–93, *Sept.* 24, 1942.—Various methods of insulation have been investigated at temperatures between $0{\cdot}2°$ and 1°K. A simple suspension of artificial silk fibre reduces the heat flow to 5 ergs/min.; "guard rings" at the same low temperature reduce the heat flow to 1 erg/min. The origin of the heat flow in various experimental arrangements is considered in its bearing on the technique of the magnetic method of cooling.

See Abstr. 3003 536.222 : 536.483 : 532.63 : 532.13

3057 536.242

High-performance fins for heat transfer. NORRIS, R. H., AND SPOFFORD, W. A. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 489–496, *July*, 1942.—The paper presents test results for groups of small discontinuous fins and pins. These results are correlated on the basis of Reynolds' number. The heat-transfer coeff. increase in inverse proportion to the square root of the size or perimeter of the surface element. The relationship between heat transfer and fluid friction is covered quantitatively. Tests of applications show satisfactory results.

See Abstr. 3003 536.483 : 532.63 : 536.222 532.13

See Abstr. 3064 536.6 : 536.7

3058 536.6 : 536.75

The heat capacity, entropy, heats of fusion, transition, and vaporization and vapour pressures of methyl mercaptan. RUSSELL, JR., H., OSBORNE, D. W., AND YOST, D. M. *J. Amer. Chem. Soc.*, 64, *pp.* 165–169, *Jan.*, 1942.

3059 536.6 : 536.75

The heat capacity, heats of fusion and vaporization, vapour pressure and entropy of dimethyl sulphide. OSBORNE, D. W., DOESCHER, R. N., AND YOST, D. M. *J. Amer. Chem. Soc.*, 64, *pp.* 169–172, *Jan.*, 1942.

3060 536.63

Some heat-capacity data for gaseous 2,2,4-trimethylpentane. KIPERASH, M., AND PARKS, G. S. *J. Amer. Chem. Soc.*, 64, *p.* 179, *Jan.*, 1942.

3061 536.631

On the relation of Debye theory and the lattice theory of specific heats. BLACKMAN, M. *Proc. Roy. Soc. A*, 181, *pp.* 58–67, *Sept.* 24, 1942.—In the Debye theory of the sp. ht. of solids the value of θ calculated from elastic const., should be the same as that found from sp. ht. data. The ratio of these θ values for crystal lattices is calculated on the basis of lattice theory; the ratio is remarkably near 1 for crystals of the NaCl type provided the crystals are not very anisotropic. In the case of other crystal types, the agreement is less good.

3062 536.65 : 669.3 = 3

Determination of the transformation energy in Cu-Al eutectoid alloys. GRUSIN, P., AND KURDJUMOW, G. *J. Phys., U.S.S.R.*, 5, 2–3, *pp.* 109–114, 1941.—The martensitic transformation β'–β_1 occurring in the eutectoid Cu-Al alloy has been investigated by the application of Sykes' method for the determination of the true sp. ht. The heat-capacity/temperature curves for alloys having from $11{\cdot}85$ to $12{\cdot}9\%$ Al showed a max. heat absorption at the β^1–β_1 transformation amounting to $4{\cdot}2$ to $4{\cdot}5$ cal./g. The data showed the transformation to extend over a temperature range of about 100°C. and in this the alloys resemble steels. On extending the measurements to higher temperatures, the lat. ht. of the eutectoid transformation $\alpha + \gamma \rightarrow \beta$ is found to amount to about 6 cal./g. R. W. P.

See Abstr. 3012 536.658 : 532.614

3063 536.662 : 541.66 = 3

Thermochemical investigations on the rotation around C-C bonds. JUNG, G., AND DAHMLOS, J. *Z. phys. Chem. A*, 190, *pp.* 230–240, *Feb.*, 1942.—The heats of combustion at const. vol. were measured for ethyleneglucol, ethyleneglucol-acetone, *cis*-cyclopentenediol and *cis*-cyclopentenediol-acetone, to determine the difference in the heat of reaction. This difference represents the mutual potential energy of the 2 OH groups in ethyleneglucol and explains the difference of the equilibrium const. in the formation of the 2 compounds. The investigations confirm the conclusions concerning the free rotation around the C-C bond. R. N.

3064 536.7 : 536.6

The entropies of nitric acid and its mono- and trihydrates. Their heat capacities from 15° to 300°K. The heats of dilution at 298·1°K. The internal rota-

tion and free energy of nitric acid gas. The partial pressures over its aqueous solutions. FORSYTHE, W. R., AND GIAUQUE, W. F. *J. Amer. Chem. Soc.*, 64, pp. 48–61, *Jan.*, 1942.—The heat capacities of HNO_3 and its monohydrate and trihydrate were measured from 15° to 300°K. The m.p., heats of fusion and of dilution and entropies, are given. The entropy values do not include the nuclear spin effect since this cancels in chemical reactions. The available partial pressure data over aq. HNO_3 solutions were investigated by the Duhem equation. No appreciable association exists in the vapour over HNO_3 solutions. The entropies were used with the known entropy of water and the measured heats of hydration to calculate the free energies of hydration. The entropy of HNO_3 gas was combined with available molecular data to investigate the internal rotation of the HNO_3 molecule. The free energy, heat content and entropy functions of HNO_3 gas, are tabulated.

3065 536.71

Thermodynamic properties of nitrogen at high pressures as analytic functions of temperature and pressure. MARON, S. H., AND TURNBULL, D. *J. Amer. Chem. Soc.*, 64, pp. 44–47, *Jan.*, 1942.—An equation of state for N is presented which reproduces the behaviour of the gas up to 1 000 atm. from − 70° to 600°. From this equation are deduced analytic functions of temperature and pressure for the activity coeff., heats, entropies, heat capacities of compression and the Joule–Thomson coeff. of the gas.

3066 536.71

The compression and expansion of air. EGAN, A. L. *Engineering*, 153, pp. 423–424, *May* 29, *and pp.* 443–445, *June* 5, 1942.—A thermodynamic study is made of certain types of pneumatic apparatus, particularly for those in which the conditions are neither truly isothermal nor adiabatic. p.v.t. relations are derived for simple adiabatic compressions and expansions, for turbo-compressors and turbo-motors, and consideration is given to the work output of compressed air motors. R. W. P.

3067 536.74

The temperature concept. BARNETT, M. K. *J. Phys. Chem.*, 46, pp. 715–723, *June*, 1942.—By theoretical reasoning the author arrives at a negative definition of temperature, in the sense that temperature equality or inequality is associated with the presence or absence, respectively, of a residual effect which persists after all other effects, assumed to have been already defined, have been eliminated by establishment of suitable conditions.

See Abstr. 3058, 3059 536.75 : 536.6

3068 536.753

Entropy of the monomeric forms of formic acid and acetic acid. HALFORD, J. O. *J. Chem. Phys.*, 10, pp. 582–584, *Sept.*, 1942.—[Abstr. 836 (1941)]. A recent measurement of the entropy is combined with vapour-density data to give $60{\cdot}0 \pm 0{\cdot}3$ as the entropy of the monomer at 25° and 1 atm. The corresponding dimer entropy is $83{\cdot}1 \pm 0{\cdot}3$ e.u. Pauling's residual entropy of $R \ln 2$ per dimer wt. for random orientation of H bonds in the crystal has been included in the above figures in order to allow a reasonable entropy for the torsional motion of the hydroxyl group in the monomer.

See Abstr. 3013 536.76 : 532.13 : 532.62

3069 536.763

Gas imperfections determined from the heat of vaporization and vapour pressure. CURTISS, C. F., AND HIRSCHFELDER, J. O. *J. Chem. Phys.*, 10, pp. 491–496, *Aug.*, 1942.—The imperfections of many gases may be obtained by combining available heats of vaporization and v.p. data with the Clausius–Clapeyron equation. The value of the gas imperfection calculated in this manner is compared with experimental second-virial coeff.

ELECTRICITY. MAGNETISM

3070 537.226.2

The measurement of dielectric constants by the comparison method. The dielectric constant of carbon tetrachloride from 15° to 40°. MILLER, J. G. *J. Amer. Chem. Soc.*, 64, pp. 117–121, *Jan.*, 1942.—A scheme of capacitance measurements at varying frequency has been applied to the comparison method of dielectric-const. determination. The principal advantage in the case of low dielectric const. is the elimination of calibration inaccuracies. The dielectric const. of CCl_4 was determined at 6 temperatures from 15° to 40°.

See Abstr. 3131 537.24 : 541.182.5

3071 537.36 : 541.182.5

Electrokinetic equations for gels and the absolute magnitude of electrokinetic potentials. BIKERMAN, J. J. *J. Phys. Chem.*, 46, pp. 724–730, *June*, 1942.—Since gels hinder the flow of liquids more than the migration of ions, the usual electrokinetic equations cannot be applied to systems incorporating swelling membranes or swollen particles. The ζ-potentials calculated in the usual way are too low in the ratio S_1/S_2, S_1 being the area of membrane permeable to liquid, and S_2 that permeable to ions. This effect, the surface conductance, and the roughness of hard solid surfaces, reduce the magnitude of electrokinetic phenomena under almost any condition.

3072 537.525 = 3

Probe measurements in rarefied air ionized by an electron beam. SZÉKELY, A., AND ZAUNER, E. *Ann. Phys., Lpz.*, 41, 3, pp. 225–232, 1942.—Probe measurements are carried out in rarefied air of 0·01–0·1 mm. Hg with electron-ray intensities of 10^{-7} to 10^{-5} A and velocities of 150–1 000 eV. The state of ionization appears to resemble the so-called plasma condition observed in highly ionized metal vapours and rare gases (carrier density $> 10^{10}$/cm.^{3}). It is concluded that the probe characteristics in weakly ionized air (carrier density about 10^5/cm.^{3}) would be the same as in the more strongly ionized plasma. Probe measurements in a gas weakly ionized by electron beams would appear suitable for investigating the dependence on the special nature of the electron beam and other experimental conditions of the state of ionization. For the evaluation of such probe measurements the paper includes a series of examples. H. G. S.

3073 537.531 : 535.3

The absence of the $M\beta$ X-ray satellite intensity anomaly. HIRSH, JR., F. R. *Phys. Rev.*, 62, pp. 137–140, *Aug.* 1 *and* 15, 1942.—The absence of the $M\beta$

X-ray satellite intensity max. is shown, and explained in terms of the relative probability of Auger transitions, the relative probabilities being determined by means of diagram line widths.

See Abstr. 2961 537.531 : 535.3 : 548 : 513.734.6

3074 537.531 : 535.4 : 548 = 4

Influence of thermal vibrations on the diffraction of X-rays, and the Fourier lattice. WEIGLE, J. *Helv. Phys. Acta*, 15, 2, *pp.* 162–174, 1942.—Theoretical. A calculation is made of the values of the Fourier coefficients of electron density in a crystal perturbed by thermal waves, and it is shown that new points arise in the reciprocal, or Fourier, lattice, which account for the phenomenon of "diffuse" X-ray reflection. J. T.

3075 537.533.73

The β-ray spectra of rubidium^{86}, strontium^{89}, ekatantalum and protactinium. HAGGSTROM, E. *Phys. Rev.*, 62, *pp.* 144–150, *Aug.* 1 *and* 15, 1942.—The theory of the action of a recently developed β-ray spectrograph is discussed briefly and an account is given of several improvements. A baffle system of greater resolving power and a G-M counting system of greater stability are described. The β-ray spectra of Rb^{86}, Sr^{89}, ekatantalum and protactinium were measured. The use of thin collodion for the backing of sources and windows of counter permitted accurate measurements down to 50 ekV.

See Abstr. 3081 537.533.73 : 539.13

3076 537.533.79 : 535.234

The theory of particles of spin half and the Compton effect. BHABHA, H. J., AND BASU, D. *Proc. Indian Acad. Sci. A*, 15, *pp.* 461–463, *June*, 1942.—Erratum. [See Abstr. 1589 (1942)].

3077 537.534.74

The elastic scattering of fast positrons by heavy nuclei. MASSEY, H. S. W. *Proc. Roy. Soc. A*, 181, *pp.* 14–19, *Sept.* 24, 1942.—The angular distribution of fast positrons scattered elastically by Hg nuclei is investigated, using Dirac's equations in conjunction with numerical tables for the corresponding fast electrons. The ratio of the scattered intensity to that given by the Rutherford formula is obtained as a function of angle for positrons with energies between 25 000 and $1{\cdot}7 \times 10^6$ eV. In all cases the ratio is < 1, decreases with increasing angle of scattering and, in contrast to electrons, does not depend very markedly on the nuclear charge. The max. asymmetry produced by double scattering of positrons at 69° from Hg nuclei is less than 1%.

3078 537.591.1 : 539.152.1

Meson theory and the magnetic moments of protons and neutrons. FRÖHLICH, H. *Phys. Rev.*, 62, *p.* 180, *Aug.* 1 *and* 15, 1942.—[See Abstr. 1075 and 1077 (1941)].

3079 538.2.01 = 3

Permeability, inductivity and hysteresis resistance with sinusoidal field strength and with sinusoidal induction. MÜCKE, G. *ENT* [*Elekt. Nachr.-Techn.*], 18, *pp.* 121–125, *June*, 1941.—When investigating the hysteresis phenomena of a magnetic material in an alternating field a sinusoidal field strength is usually assumed. The author investigates the relations under the assumption of a sinusoidal induction. This leads to somewhat different expressions, but the differences are only slight for small magnetic forces. For analogy with active, reactive and apparent power, similar definitions for permeabilities are stated. R. N.

See Abstr. 3142 538.22 : 541.67

3080 538.691 = 4

Movement of charged particles in the field of a magnetic dipole in a family of periodic orbits. GODART, O. *Rev. Univ. Tucumán A*, 2, *pp.* 109–129, *Dec.*, 1941.—A mathematical paper. The differential equations obtained cannot be solved by the usual methods, but lead to the existence of periodic orbits. The work is limited to the consideration of a family of such orbits which plays an important part in the theory of cosmic rays. A. J. M.

MOLECULAR AND ATOMIC PHYSICS

3081 539.13 : 537.533.73

An electron diffraction investigation of the molecular structures of silicon tetrabromide, tribromosilane, and dibromodifluorosilane. SPITZER, R., HOWELL, JR., W. J., AND SCHOMAKER, V. *J. Amer. Chem. Soc.*, 64, *pp.* 62–67, *Jan.*, 1942.—The molecular structures of $SiBr_4$, $SiHBr_3$ and SiF_2Br_2 were studied by the electron diffraction method. In all of these molecules the Si–Br distance is $2{\cdot}16 \pm 0{\cdot}03$ Å, and the valence angles are but little distorted from the tetrahedral value. The relative temperature factors have been estimated for $SiBr_4$ and $SiHBr_4$ from the appearance of the electron diffraction photographs.

3082 539.132

Vibration-rotation energies of planar ZXY_2 molecules. I. The vibrational modes and frequencies. SILVER, S., AND EBERS, E. S. **II. The quantum-mechanical Hamiltonian and the energy values.** SILVER, S. *J. Chem. Phys.*, 10, *pp.* 559–574, *Sept.*, 1942.—The normal modes and frequencies of planar ZXY_2 molecules are investigated, using the most general potential function consistent with the symmetry. The equilibrium configuration has the symmetry of the group C_{2v} and the frequencies are all non-degenerate. By developing a set of generalized co-ordinates having the same symmetry properties as the normal co-ordinates, the secular determinant is factored directly into one third-order determinant, one linear factor and one second-order determinant. The elements of the secular equation are evaluated to include all the first- and second-order terms in the Hamiltonian. With the view of applying the theory to the analysis of the fundamental bands of formaldehyde, the effect of an approx. degeneracy between a pair of perpendicular vibrations, of symmetry types B_1 and B_2, respectively, is considered. For this case, the vibration-rotation energies of the states giving rise to the fundamental bands are investigated to the first order of approximation.

3083 539.132 : 541.651

Energy levels and colour of polymethine dyes. SKLAR, A. L. *J. Chem. Phys.*, 10, *pp.* 521–531, *Aug.*, 1942.—The roots of the secular determinant [Abstr. 3084 (1942)] are applied to a discussion of the longest-wavelength electronic band of symmetrical

and unsymmetrical polymethines. The LCAO approximation gives good numerical values for the dependence of both the transition energy and oscillator strength on the length of the polymethine chain in symmetrical dyes, but cannot handle the questions which depend sensitively on a small difference between the groups attached to the 2 N atoms at the extreme ends. Although the HLSP method yields correct qualitative results for symmetrical dyes, it does not give good numerical values. The HLSP method is sensitive to a difference between the 2 ends of the dye molecule and affords a simple explanation for a number of properties in which unsymmetrical dyes differ from symmetrical ones.

3084 539.132 : 541.651 : 535.343

On the absorption spectrum of some polymethine dyes. HERZFELD, K. F. *J. Chem. Phys.*, 10, *pp.* 508–520, *Aug.*, 1942.—The energy levels of certain polymethine dyes are calculated approximately. The dyes consist of a chain of conjugated double bonds, with end groups which might or might not differ from each other. Ions and neutral molecules are treated. The calculations are performed both with the valence-bond method and the LCAO method, but without antisymmetrization and without taking electronic interaction into account. The effect of chain length and of the nature of the end groups is discussed.

3085 539.133

Internal rotation in molecules with two or more methyl groups. PITZER, K. S. *J. Chem. Phys.*, 10, *pp.* 605–606, *Sept.*, 1942.

3086 539.133 : 541.57

The dipole moments and structures of five organometallic halides. OESPER, P. F., AND SMYTH, C. P. *J. Amer. Chem. Soc.*, 64, *pp.* 173–175, *Jan.*, 1942.—The dipole moments were measured in benzene solution. Min. values are calculated for the metal-to-halogen bond moments in 3 compounds and used to estimate the min. amounts of ionic character in the bonds.

3087 539.152

The energy of the $1s2s^3S$ state of the helium atom and related two-electron ions. WHEELER, T. S. *Proc. Roy. Irish Acad. A*, 48, 2, *pp.* 43–53, *July*, 1942.—Calculations are completed analytically for the lowest triplet state of helium and related 2-electron ions. The values for the energy agree with experimental results, and with calculated results previously obtained. These results confirm the approx. validity of two empirical rules—namely, that the interaction between an inner electron and the nucleus is not sensibly affected by an electron in an outer orbit; and that, for related atoms and ions, the screening effect of an inner on an outer electron is independent of the atomic number.

3088 539.152

Force constants and internuclear distance. GLOCKLER, G., AND EVANS, G. E. *J. Chem. Phys.*, 10, *p.* 606, *Sept.*, 1942.

3089 539.152.1

The pseudoscalar meson field with strong coupling. PAULI, W., AND DANCOFF, S. M. *Phys. Rev.*, 62, *pp.* 85–108, *Aug.* 1 *and* 15, 1942.—The energy levels of the excited states of the heavy particle and the scattering cross-section for free mesons are computed by wave-mechanical methods. An expression is obtained for the magnetic moment of the proton or neutron. While the scattering cross-section can, with reasonable assumptions, be brought into agreement with experimental values, the results for the magnetic moment are qualitatively at variance with the known values in that equal and opposite moments are predicted for proton and neutron.

3090 539.152.1

Electromagnetic properties of nuclei in the meson theory. MA, S. T., AND YU, F. C. *Phys. Rev.*, 62, *pp.* 118–126, *Aug.* 1 *and* 15, 1942.—The mathematical treatment of the interaction of a meson field with an electromagnetic field is simplified by using Pauli's method [Abstr. 3089 (1942)]. A discussion of calculation of exchange multipole moments of nuclei by the method of canonical transformation and the results for dipole moments in the pseudoscalar theory are given.

3091 539.152.1

Tensor forces and heavy nuclei. VOLKOFF, G. M. *Phys. Rev.*, 62, *pp.* 126–133, *Aug.* 1 *and* 15, 1942.—A rough quantitative estimate of the relative contributions of the central-force term and the tensor to the binding energy of a nucleus is made on the basis of a simplified nuclear model. A tensor interaction between 2 nuclear particles of the form suggested by the neutral meson field theory of nuclear forces with constants determined to fit the exp. data on the 2-particle neutron-proton system would lead to the existence of moderately light nuclei having binding energies, spins and deviations from spherical shape, much greater than those observed.

3092 539.152.1

Non-central forces in the nuclear two-body problem. HEPNER, W., AND PEIERLS, R. *Proc. Roy. Soc. A*, 181, *pp.* 43–57, *Sept.* 24, 1942.—The nuclear 2-body problem is discussed on the assumption that the range of the forces is small compared with the size of the deuteron, but without specific assumptions about the forces. Using the values for the binding energy of the deuteron and its electric quadripole moment from observation, and eliminating a possible ambiguity in the deuteron wave function by means of the observed magnetic moments, it is found that the formulae for the electric and magnetic photo-effect in the deuteron remain the same as for central forces, with minor modifications. The same is found for the scattering of neutrons by protons at energies of a few MV or less.

3093 539.152.1

A note on exchange tensor forces in heavy nuclei. VOLKOFF, G. M. *Phys. Rev.*, 62, *pp.* 134–136, *Aug.* 1 *and* 15, 1942.—If tensor forces, whether of the ordinary or the exchange type, are assumed to be the dominant forces between nuclear particles, they will not lead to saturation, but will permit the existence of nuclei with excessive values of binding energy, spin and isotopic number. The presence of a sufficiently strong spherically symmetrical exchange term in the nuclear interaction seems to be required to counteract this effect of the tensor forces.

See Abstr. 3078 539.152.1 : 537.591.1

3094 539.152.1 : 539.164.1

The fine structure of nuclear energy levels on the alpha-model. KITTEL, C. *Phys. Rev.*, 62, *pp.* 109–117, *Aug.* 1 *and* 15, 1942.—The splitting for He^5, which should be very similar to that for Li^5, is discussed on the α- and central-field models. A deuteron group model for the α-particle is considered in addition to the simple α-group. Li^7 is treated from the standpoint of the theory of "holes" and also on a modified α-particle model. The contribution of the exchange terms to the splitting in He^5 is greater by a factor of the order of 2 or 3 on the α-model than on the central-field model. So far as ordinary terms for Li^7 are concerned, the spin-orbit interaction of a "hole" in a concentrated closed shell with a closed shell is the same, apart from a numerical factor, as the spin-orbit interaction of a single particle with a closed shell. The exchange terms for Li^7 are approx. ∝ the degree of overlapping of the α- and triton groups. The exchange splitting has the same sign as the ordinary splitting.

See Abstr. 3124 539.16 : 541.144.7

3095 539.16.08

On the decay of slow mesons. SANTOS, M. D. DE S. *Phys. Rev.*, 62, *pp.* 178–179, *Aug.* 1 *and* 15, 1942.—The disintegration electron intensity was measured at different time intervals, after the mesons came to rest, through the use of a variable time-delay coincidence set.

3096 539.163.4 : 541.18

Isolation of radioactive yttrium and some of its properties in minute concentrations. KURBATOV, J. D., AND KURBATOV, M. H. *J. Phys. Chem.*, 46, *pp.* 441–457, *April*, 1942.—The behaviour is reported of Y in solution in a *p*H range of 6·4 to 8·6, attained by addition of NH_3 solution to acid solutions over a wide conc. range. At *p*H about 7, the % of Y coagulated and filtered off from weighable conc. increases with decrease in conc., according with the assumption that, contrary to usual principles, the coagulation process becomes more effective under the known similar conditions of *p*H and salt conc. when fewer atoms of Y are present in solution. The removal of Y from minute conc., at *p*H 7 or higher, is a process similar to its removal when weighable quantities are used. Experimental data show that Y can be removed from solutions the conc. of which are well below that corresponding to the solubility product.

N. M. B.

See Abstr. 3094 539.164.1 : 539.152.1

3097 539.172.4 = 3

On the effective cross-section of some of the elements to slow neutrons. LAUTERJUNG, K. H. *Ann. Phys., Lpz.*, 41, 3, *pp.* 177–192, 1942.—The results of the measurements of the effective cross-section to thermal neutrons of Ga, Ge as GeO_2, Rb as RbI, In, Cs as CsCl and Hf as HfO_2 are given in the accompanying table. The neutrons are produced by the D + D process and were detected in an ionization chamber filled with BF_3. The technique employed is described with schematic illustrations of the apparatus. Dunning's value for Ge is discussed and his value for Zr corrected to $\sigma = 15{\cdot}0 \times 10^{-24}$ cm.² [Abstr. 3719 (1935)]. The energy of the In resonance neutrons is evaluated at $E_r = 0{\cdot}95$ eV.

Element	Compound used	σ in 10^{-24}cm.² (compound)	σ in 10^{-24} cm.² (element)
Ga	Ga	18·5 ± 7·6	18·5 ± 7·6
Ge	GeO_2	30·9 ± 7·3	24·3 ± 7·3
Rb	RbI	21·2 ± 1·9	11·8 ± 1·9
In	In	198·6 ± 11·3	198·6 ± 11·3
Cs	CsCl	89·5 ± 3·8	50·5 ± 3·8
Hf	HfO_2	170·4 ± 29·9 uncorrected 182·0 ± 29·0 corrected	175·4 ± 29·0

H. G. S.

3098 539.172.4 = 3

The effective cross-section of krypton and xenon to slow neutrons. RIEZLER, W. *Ann. Phys., Lpz.*, 41, 3, *pp.* 193–195, 1942.—The effective cross-sections of Kr and Xe to slow electrons are determined by the method used by Lauterjung [Abstr. 3097 (1942)] and found to be $(23{\cdot}5 \pm 14) \times 10^{-24}$ cm.² and $(36{\cdot}9 \pm 13) \times 10^{-24}$ cm.². H. G. S.

3099 539.216 : 677.46 = 3

Science and technique in cell-wool research. LÖBERING, J. *Kolloid Z.*, 98, *pp.* 186–191, *Feb.*, 1942.—In order to obtain a readily controllable method of manufacturing xanthogenated alkali cellulose, the raw material must be ground to such an extent that the biological structure is destroyed. The alkalizing should be accomplished with constant conc. of cellulose and alkali throughout the process. 8% NaOH is sufficient. The solution process is continued until the desired spinning properties of the viscose are reached. R. N.

3100 539.216.1 = 3

The gel structure of synthetic fibres of regenerated cellulose I. HUBERT, E., MATTHES, A., AND WEISBROD, K. *Kolloid Z.*, 98, *pp.* 173–180, *Feb.*, 1942.—Systematic tests with a centrifuge requiring a charge of only 0·5 g. and working with 800 times natural gravity were made for investigating the gel character of cellulose fibres. A tendency to syneresis was found, the rate of which was normally less than the rate of dehydration. A more rapid syneresis is obtainable either by repeated wetting and drying, by steaming, or by treating the fibre with dehydrated NH_4Cl. A limiting value for the swelling is found to be 50–55 parts of water in 100 parts of dry cellulose. This value corresponds to the max. value of absorbed steam obtained by extrapolating the respective absorption isotherm. R. N.

3101 539.216.1 = 3

The supermolecular structure of cellulose. KRATKY, O. *Kolloid Z.*, 96, *pp.* 301–310, *Aug.–Sept.*, 1941, *and* 98, *pp.* 170–172, *Feb.*, 1942.—After discussing the different views on the state of dispersion of cellulose dissolved in xanthogenate, the author explains the supermolecular structural principle of hydrated cellulose in its different states. [See Abstr. 1621 (1942)]. R. N.

3102 539.216.1 : 531.71 : 677.3

A new technique for the analysis of fibre-length distribution in wool. DANIELS, H. E. *J. Text. Inst.*,

Manchr, 33, *T* 137–*T* 150, *Aug.*, 1942.—A sampling technique is proposed which appears sufficiently satisfactory to form the basis of a std. method, and the possible sources of bias in the measurement of individual fibres are also discussed. A very full description is then given of the cut-squaring method for the analysis of fibre-length distribution, which is based on the principle that, if the top of the sample is cut instead of being broken, the end of the top is then in the correct state for the extraction of the sample draw. The squaring and measuring processes are illustrated by photographs and diagrams. A discussion is given of fibre tension at measurement.

H. H. HO.

See Abstr. 3035 539.23 : 535.312

3103 539.26

The diffraction of X-rays by liquid oxygen. SHARRAH, P. C., AND GINGRICH, N. S. *J. Chem. Phys.*, 10, *pp.* 504–508, *Aug.*, 1942.—The X-ray diffraction pattern of liquid O at 89°K. shows an intense peak at $\sin\theta/\lambda = 0{\cdot}157$, and very weak peaks at 0·35 and at 0·5; that at 62°K. shows an intense peak at 0·159, and weak peaks at 0·35 and at 0·5. The atomic distribution curves have 4 peaks for 89°K. and 4 for 62°K.

3104 539.26

Chain structure of linear polyesters—trimethylene glycol series. FULLER, C. S., FROSCH, C. J., AND PAPE, N. R. *J. Amer. Chem. Soc.*, 64, *pp.* 154–160, *Jan.*, 1942.—Fibre patterns produced by stretching oriented fibres of the polyesters were examined. The results favour the presence in the crystalline regions of essentially planar zigzag chain molecules inclined to the fibre axis. Evidence of amorphous regions containing disordered kinked chains has been obtained. Intermediate states of order have also been observed in which the chains are parallel but otherwise unordered. Evidence is found in support of randomly rotated crystallites containing dipole layers and extended chains inclined at approx. 60° to these layers.

3105 539.26

The structure of graphite. LIPSON, H., AND STOKES, A. R. *Proc. Roy. Soc. A*, 181, *pp.* 101–105, *Sept.* 24, 1942.—A new structure of carbon is proposed in order to account for the occurrence of extra lines on X-ray powder photographs of graphite. It has hexagonal layers similar to those of graphite, but arranged in a different sequence. About 14% of the new structure is present in the samples examined.

3106 539.26 = 3

X-ray Fourier synthesis of quartz. BRILL, R., HERMANN, C., AND PETERS, C. *Ann. Phys., Lpz.*, 41, 3, *pp.* 233–244, 1942.—A Fourier synthesis is conducted of the electron density of quartz projected on $(1\,1\bar{2}0)$. On a line connecting Si and O almost exactly perpendicular to the direction of projection, the electron density does not fall off almost to zero, as should be the case for an ionic lattice, but drops only to 2·25 electrons per Å. This electron density corresponds to an interpenetration of the electron sheaths of Si and O without a supplemental electron accumulation as found in the homopolar-linked diamond. This renders a transition state probable between homopolar and heteropolar linkage.

H. G. S.

ELASTICITY. STRENGTH

3107 539.383

A stress/strain curve for the atomic lattice of mild steel in compression. SMITH, S. L., AND WOOD, W. A. *Proc. Roy. Soc. A*, 181, *pp.* 72–83, *Sept.* 24, 1942.—A set of atomic planes is selected of which the spacing is practically perpendicular to the direction of the stress, and the change in spacing is measured as the magnitude of the applied stress is systematically varied. The behaviour of the lattice is compared with the corresponding stress/strain relation for the external dimensions in the compression test, and also with the lattice stress/strain curve previously obtained for the same material when subjected to tensile stress. The lattice possesses a yield point in compression, marking the onset of a permanent lattice strain. The direction of this strain is opposite to that found in tension [Abstr. 1135 (1941)], and the magnitude increases systematically with the applied stress. The experiments on the pure iron show that under extreme deformation the permanent lattice strain tends to a limit and that with continued deformation partial recovery from the strain may occur. The results suggest that the mechanics of the metallic lattice involve the principle that, after the lattice yield point, in a given direction the lattice systematically assumes a permanent strain in such a sense as to oppose the elastic strain induced by the applied stress.

3108 539.4.013

The mechanical properties of metal foils. CHALMERS, B., AND SEDDON, P. W. *J. Inst. Met.*, 68, *pp.* 283–309, *Sept.*, 1942.—Specially devised instruments were used for measurements on the tensile properties, the force-deformation-time characteristics under const. or slowly changing bending forces, and the residual deformation after momentarily applied bends. The effects of thickness, composition and time after rolling were examined, the most significant result being the extremely rapid variation of the bending properties with thickness in the range 0·03–0·04 mm. The results of the static bend tests can be represented by a force-deformation-time surface, from which properties other than those measured can be deduced.

3109 539.531

The hardness of primary solid solutions with special reference to alloys of silver. FRYE, JR., J. H., AND HUME-ROTHERY, W. *Proc. Roy. Soc. A*, 181, *pp.* 1–14, *Sept.* 24, 1942.—Accurate Meyer analyses have been made on annealed bars of vacuum-melted spectroscopically pure Ag, assay Ag and on binary alloys of Ag containing up to 5 atom. % of Cd, In, Sn, Sb, Zn, Al, Mg and Au. The ultimate Meyer hardness P_u increases as the grain size of the specimens diminishes. By means of suitable annealing treatments results were obtained for different grain sizes of alloys containing approx. 2·4 and 5·0 atom. % of the above elements, and these were used to deduce P_u-values referring to 1 std. grain size. The results are discussed from the standpoint of lattice distortion, and it is shown that, for a given atom. percentage of solute, the increase in P_u is $\propto$ (lattice distortion for solutes in the same row of the Periodic Table).[2]

PHYSICAL CHEMISTRY

3110 541.123.2

The vapour phase esterification equilibrium. HALFORD, J. O., AND BRUNDAGE, D. *J. Amer. Chem. Soc.*, 64, *pp.* 36–40, *Jan.*, 1942.—The equilibrium const. for the esterification of acetic acid by ethyl alcohol was measured from 40° to 100° for dilute solutions of the acid and ester in a solvent containing 1·2237 moles of water per mole of alcohol. The result at 40° was converted to the vapour phase const. with the aid of vapour composition studies made by the air saturation method.

3111 541.123.3 : 518.4

Graphical method for interconversion of ternary compositions. SUN, K. H., AND SILVERMAN, A. *Industr. Engng Chem.*, 34, *pp.* 872–873, *July*, 1942.—Two simple graphical methods were proposed [Abstr. 2675 (1942)] for the interconversion of binary compositions. With the help of one of these, a graphical method for the interconversion of ternary compositions has been developed.

3112 541.124.7 : 541.552

The empirical correlation of the activation energies of gaseous unimolecular reactions with vibrational frequencies. FUGASSI, P., AND WARRICK, E. *J. Phys. Chem.*, 46, *pp.* 630–639, *June*, 1942.—An empirical equation relating a vibrational frequency of a given bond and the activation energy of a unimolecular reaction involving that bond is proposed. The equation is applied and the results tabulated for practically all reactions for which the necessary data are available.

3113 541.126

Mechanism of the thermal reaction between hydrogen and oxygen. ELBE, G. VON, AND LEWIS, B. *J. Chem. Phys.*, 10, *pp.* 366–393, *June*, 1942.—From measurements of explosion limits and reaction rates under various conditions in spherical vessels, clean or coated with various substances, the chain-breaking mechanism is discussed, and from a critical analysis of all imaginable reactions the following mechanism, where M is any third molecule, is deduced: $H_2O_2 + M = 2OH$; $OH + H_2 = H_2O + H$; $H + O_2 = OH + O$; $O + H_2 = OH + H$; $H + O_2 + H_2O_2 = H_2O + O_2 + OH$; $H + O_2 + M = HO_2 + M$; $HO_2 + H_2O_2 = H_2O + O_2 + OH$; $HO_2 + H_2 = H_2O_2 + H$; $2HO_2 \xrightarrow{\text{surface}} H_2O_2 + O_2$; $H_2O_2 \xrightarrow{\text{surface}} H_2O + \frac{1}{2}O_2$; $H_2 + O_2 \xrightarrow{\text{surface}} H_2O_2$; H, O, $OH \xrightarrow{\text{surface}}$ chain destruction. Kinetic equations are derived and values of activation energies and rate coeff. and conc. of HO_2 and H are given. N. M. B.

3114 541.127

The derivation of a general kinetic equation for reaction between ions and dipolar molecules. AMIS, E. S., AND JAFFÉ, G. *J. Chem. Phys.*, 10, *pp.* 598–604, *Sept.*, 1942.—An equation has been derived for the reaction-rate const. in the case of ion-dipole reactions. Debye–Hückel's theory of ionic atmospheres is extended to the case of dipoles surrounded by ions, coupling it with Onsager's theory of electric moments of molecules in liquids. The potential constructed is applied to the derivation of the rate const. The result is substantiated by existing data.

3115 541.127

The saponification of acetylsalicylic acid at 35°. STURTEVANT, J. M. *J. Amer. Chem. Soc.*, 64, *pp.* 77–80, *Jan.*, 1942.—The velocity of saponification of acetylsalicylic acid at 35° was investigated by the calorimetric method. [Abstr. 621 (1941)]. The results agree with Brönsted's theory.

3116 541.127 : 535.371

Solvent effects on the kinetics of ionic reactions and the choice of the concentration scale. DAVIS, H. G., AND LAMER, V. K. *J. Chem. Phys.*, 10, *pp.* 585–597, *Sept.*, 1942.—The mole fraction scale gives simpler relations between the variables determining kinetics on changing solvents for the bromacetate-thiosulphate reaction than does the usual vol. molar scale. The generality and basis of this finding is discussed. The quenching of fluorescence, which involves diffusion as a rate-determining step, is a more nearly linear function of the fluidity when the data are expressed in mole fraction than in the vol. molar scale.

3117 541.133

The conductance of potassium iodate at 25° and the mobility of the iodate ion. KRIEGER, K. A., AND KILPATRICK, M. *J. Amer. Chem. Soc.*, 64, *pp.* 7–9, *Jan.*, 1942.—The conductance of KIO_3 was measured over the range 0·0001 to 0·1 molar in water at 25°. The mobility of the iodate ion at inf. dilution was calculated from the conductance of KIO_3 and KCl and the mobility of the chloride ion.

3118 541.133

Studies on high-molecular-weight aliphatic amines and their salts. IV. Electrical conductivities of aqueous solutions of the hydrochlorides and acetates of dodecyl- and octadecylamines. RALSTON, A. W., HOERR, C. W., AND HOFFMAN, E. J. *J. Amer. Chem. Soc.*, 64, *pp.* 97–101, *Jan.*, 1942.—Conductivities and densities of aq. solutions of dodecyl- and octadecylamine acetates and the corresponding hydrochlorides were determined. The conductivity curves show 3 ranges characteristic of colloidal electrolytes. These salts appear as simple strong electrolytes in dilute solution.

3119 541.133

Studies on high-molecular-weight aliphatic amines and their salts. VI. Electrical conductivities of aqueous solutions of the hydrochlorides of octyl-, decyl-, tetradecyl- and hexadecylamines. RALSTON, A. W., AND HOERR, C. W. *J. Amer. Chem. Soc.*, 64, *pp.* 772–776, *April*, 1942.—[See Abstr. 2049 (1942)].—Conductivities and densities of aq. solutions of the hydrochlorides of octyl-, decyl-, tetradecyl- and hexadecylamines are determined. The equivalent conductance of these salts are discussed with reference to the modern theories of colloidal electrolytes.

3120 541.134.5

A potentiometric study of the oxidation of phenylhydrazine by cupric ions, including the titration of Fehling's solution with phenylhydrazine. BRITTON, H. T. S., AND CLISSOLD, E. M. *J. Chem. Soc.*, *pp.* 528–531, *Aug.*, 1942.—The oxidation of phenylhydrazine by cupric ions present in complex solutions, viz. as tartrate, together with caustic alkali, borax or alkali phosphate, acetate or carbonate, has been investigated potentiometrically at 93°. Benzene and phenol are formed simultaneously, and the results show that, when the difference between the potentials set up at a Pt electrode before and after the com-

etion of the oxidation is small, the amount of benne formed predominates, but when the difference is ge a greater proportion of phenol is produced.

3121 541.135.5

A criticism of the Teorell–Meyer–Sievers theory membrane permeability. FETCHER, JR., E. S. *J. ys. Chem.*, 46, *pp.* 570–574, *May*, 1942.—The sigficance of the parameters of the Teorell–Meyer–evers theory of membrane permeability is discussed. ll of the data by Meyer and Sievers for simple stems are plotted, and the parameters evaluated aphically. The majority of these selectivity const. d sieve effect parameters do not conform to the quirements of the theory.

3122 541.138

The formal oxidation-reduction potentials of thallous-allic salts in aqueous hydrochloric-acid solutions. ormation of chlorothallate complex ions. HUGHES, . H., AND GARNER, C. S. *J. Amer. Chem. Soc.*, 64, p. 1644–1648, *July*, 1942.—The formal oxidation-duction potential was determined at 25° and 15°. Measurements were made of the potentials in mixtures f HCl and $HClO_4$ solutions of const. total acid conc. nd const. ionic strength. The results were interreted in terms of the formation of chlorothallate nions of the type $TlCl_4^-$ and $TlCl_6^{---}$.

3123 541.141

The photochemistry of isobutene. I. KIEFFER, V. F., AND HOWE, J. P. *J. Amer. Chem. Soc.*, 64, p. 1–7, *Jan.*, 1942.—The effect of approx. monohromatic radiation from the Al spark, about 1900 Å, n isobutene was investigated. Both decomposition nd polymerization occur. The essential features re: at l.p. the most important reactions are splitting f the excited isobutene molecule into primary free adicals which recombine in the gas phase and on the vall, some of them reacting with isobutene molecules. At h.p. the excited molecules are quenched to a large xtent, the radicals which are formed reacting chiefly vith isobutene to form other radicals which eventually ombine. No methylacetylene could be found.

3124 541.144.7 : 539.16

Some experiments on chlorophyll and photosynthesis sing radioactive tracers. RUBEN, S., FRENKEL, A. W., ND KAMEN, M. D. *J. Phys. Chem.*, 46, *pp.* 710–714, *June*, 1942.—Using short-lived radioactive Mg as a racer, an unsuccessful attempt was made to detect he interconversion of chlorophylls *a* and *b* during hotosynthesis.

3125 541.144.8

The photochemical decomposition of cyclic ketones. BENSON, S. W., AND KISTIAKOWSKY, G. B. *J. Amer. Chem. Soc.*, 64, *pp.* 80–86, *Jan.*, 1942.—Cyclohexanone, cyclopentanone and cyclobutanone, were prepared and their absorption spectra and v.p. measured. The ketones were subjected to photochemical decomposition in a flow system and the products analysed, runs being made over the temperature range 150°–350° and the pressure range 30–200 mm. The ratio of the quantities of gaseous products formed is independent of both the temperature and the pressure. Condensation products were formed only in the case of cyclohexanone and the quantity of these products depends on both temperature and pressure.

3126 541.18 : 535.4

The scattering of light by an aggregate of small dielectric particles. LANDSHOFF, R. *J. Phys. Chem.*, 46, *pp.* 778–782, *June*, 1942.—The author establishes a relation between the factor by which the absorption of light is increased, and the average distance between the particles and their total number N in any one group, when the colloidal particles are not distributed uniformly but cluster together in groups.

See Abstr. 3096 541.18 : 539.163.4

See Abstr. 3004 541.18.025 : 532.13

3127 541.18.04

The effect of small concentrations of hexametaphosphate on iron oxide surfaces. HAZEL, F. *J. Phys. Chem.*, 46, *pp.* 516–524, *April*, 1942.—The fact that colloidal hydrous oxides of Fe are produced in the rusting of the metal has served as a basis for the present investigation. Stability, flocculation and deflocculation and mobility determinations, were made with Na hexametaphosphate on Fe oxide sols at different conc. and at different hydrogen-ion activities. The effect of Ca-ion conc. has also been investigated, and, for purposes of comparison, parallel experiments have been conducted throughout with Na pyrophosphate and Na_3PO_4. Some measurements on Al oxide suspensions are also recorded. The property of hexametaphosphate to peptize or disperse finely divided solids is emphasized. The coagulating power of different phosphates is found to increase with the valency of the neg. ion. The mechanism of the flocculation process involves adsorption of ions, which results in a decrease in mobility of the colloidal particles. With positive hydrous oxide sols, flocculated with strongly adsorbable negative ions, coagulation starts before the isoelectric point is reached and continues after the particles are recharged. At higher ionic conc. the particles become strongly neg. and stable. H. H. HO.

3128 541.182 : 532.13

Viscosity measurements during the coagulation and gelation of concentrated sols of zirconium and stannic hydroxides. PRASAD, M., AND MODAK, K. V. *Proc. Indian Acad. Sci. A*, 15, *pp.* 445–455, *June*, 1942.—An examination has been attempted of the relationship betw. the processes of coagulation and gelation of systems which contain the same coagulating and gelating substance. For this purpose, sols and gels of Zr hydroxides were studied and experiments were performed with sols of stannic hydroxide since they, under not very different conditions, were found to give rise to true coagulation and gelation. The viscosity method has been employed and full experimental details are included. Preparative methods for the various sols are described and it was found that the addition of electrolytes to the sols of Zr and stannic hydroxide, undialysed or dialysed for 12 days, produces coagulation. A gel is formed, on the other hand, by the addition of coagulators to the extremely dialysed stannic hydroxide sol. The coagulation of the same sol (undialysed stannic hydroxide sol) by mercuric chloride differs from that by KCl. The dialysis of the stannic hydroxide sol for 12 days changes its condition to a very great extent. A distinction is made between two types of viscosity/time curves indicative of rapid coagulation. The curves for

the coagulation and gelation of the same sol show similar characteristics. H. H. HO.

3129 541.182.021 : 532.13

Viscometric estimation of particle dimensions. I. The system stearic-acid–carbon-tetrachloride. HOLLIHAN, J. P., AND BRIGGS, D. R. *J. Phys. Chem.*, 46, *pp.* 685–693, *June*, 1942.—Rel. viscosities were determined with a probable error of 3 : 10 000 for 0·000–4·000% stearic-acid–CCl_4 solutions. The determinations were made at a low rate of flow. The particle length/diameter ratio, as calculated by the Sakurada procedure, does not confirm that reported by Theis and Bull. A simple procedure for carrying out a rate-of-flow study is described. The concordance with the complete Einstein equation is evidence that the stearic acid molecules assume a spherical shape in CCl_4. Some aggregation is indicated. The calculated partial sp. vol., 1·41, is 30% higher than the sp. vol. in the dry state.

3130 541.182.5

Studies on the hydrogel of zirconia. I. The time of set. HURD, C. B., FALLON, W. A., AND HOBDAY, R. W. *J. Amer. Chem. Soc.*, 64, *pp.* 110–114, *Jan.*, 1942.—Hydrogels of zirconia were prepared by mixing solutions of Na_2CO_3 or sodium acetate and zirconium oxychloride. This raises the *p*H of the latter solution from 0·1, where it does not set, up to from 2·0 to 5·0. The time of set was found in terms of temperature, *p*H and conc. of added electrolyte. The gels are softer than corresponding silicic acid gels, show some syneresis, but do not hold their form. Gels formed at 25° in a few min. reliquefy at const. temperature in a few hr. Raising the temperature to 60° caused regelation and subsequent cooling caused reliquefication. The time of set is decreased by adding KCl in low conc.

3131 541.182.5 : 537.24

Sensitization and surface charge of lyophilic colloids. HAUSER, E. A., AND CINES, M. R. *J. Phys. Chem.*, 46, *pp.* 705–709, *June*, 1942.—A new concept of sensitization which will also explain the coagulation of lyophobic sols on the addition of lyophilic colloid alone is now proposed, viz.: The inner layer of charges of the Gouy diffuse double is held to be firmly attached to the colloid particle, and fits approx. into the crystalline structure. The outer or diffuse layer is merely an increased density of ions in the surrounding dispersion medium, and when the lyophilic colloid is adsorbed on the surface of the lyophobic particles, it effectively covers a portion of the inner layer. Since a portion of the surface has been covered, the ions in the diffuse layer immediately above must have been pushed aside to allow passage for the lyophilic particle. Furthermore, since there is still a net charge on the surface, these ions will not tend to wander off into the dispersion medium, but will remain concentrated around the particle. Thus, the double layer on the uncovered surface in the immediate vicinity of the covered portion will have an increased density of counter-ions and the particle will have been partially neutralized or sensitized. In this manner it seems possible to explain all the phenomena of sensitization, excepting the peptization observed by Freundlich and Brossa. This concept explains a greater number of data than any other yet submitted. H. H. HO.

See Abstr. 3071 541.182.5 : 537.36

3132 541.182.6.025

On reversible aggregations of colloidal particles. II. The isothermal and reversible change of absorption in thixotropic iron oxide sols. HELLER, W., AND QUIMFE, G. *J. Phys. Chem.*, 46, *pp.* 765–777, *June* 1942.—[See Abstr. 1872 (1939)]. The thixotropic sol-gel transformation in systems with strongly diffracting goethite crystals is accompanied by a reversible change in conservative absorption. This hitherto unknown effect lends support to the hypothesis that the setting of a thixotropic system may be the result of its separation in 2 phases, one a conc phase of geloids, and the other a dilute phase of primary particles. The influence of the colloid conc upon the reversible optical effect is investigated. The rate of setting, as determined in measurements of setting time, is compared with the rate of change in conservative absorption.

3133 541.182.63 : 548.5

Studies on ageing and coprecipitation. XXXVI. Mixed-crystal formation of lead molybdate with colloidal and flocculated lead chromate. KOLTHOFF, I. M., AND EGGERTSEN, F. T. *J. Phys. Chem.*, 46, *pp.* 616–620, *June*, 1942.—The distribution coeff. of chromate between an aq. solution and mixed crystals of lead chromate and lead molybdate was found to be about 250 at room temperature. When lead chromate in the colloidal state is shaken with a solution of molybdate, only surface exchange occurs. After flocculation of the sol, a rapid interaction between solid lead chromate and a molybdate solution or between solid lead molybdate and a chromate solution occurs, indicating rapid recrystallization of the solids in the flocculated state.

3134 541.183

Adsorption of organic compounds. I. Adsorption of ampholytes on an activated charcoal. CHELDELIN, V. H., AND WILLIAMS, R. J. *J. Amer. Chem. Soc.*, 64, *pp.* 1513–1516, *July*, 1942.—Adsorption isotherms have been obtained for 33 amino acids, vitamins and related substances using Darco G-60 as the adsorbent. The experimental data fit the equation commonly known as the Freundlich adsorption isotherm. Several generalizations have been evolved from the data which show certain trends (based upon structure) in adsorption and in the $1/n$ values of the Freundlich equation. The presence and position of polar groups and the presence or absence of aromatic nuclei are important factors.

3135 541.183.1

A new technique for adsorption studies. COULL, J., ENGEL, H. C., AND MILLER, J. *Industr. Engng Chem. (Analyt. Edit.)*, 14, *pp.* 459–462, *June* 15, 1942.—Use of the thermal-conductivity cell for analysis of the effluent gases from a carbon-packed tower makes possible accurate determination of the stoichiometry of the adsorption process. This method is especially useful in large-scale equipment for indicating the extent of adsorption. An empirical equation which can be employed to represent efficiency/time relations is presented.

See Abstr. 3112 541.552 : 541.124.7

See Abstr. 3086 541.57 : 539.133

136 541.61

Structure of vinyl polymers. XII. The polymer of ethyl isopropenyl ketone. MARVEL, C. S., RIDDLE, H., AND CORNER, J. O. *J. Amer. Chem. Soc.*, 64, 92–94, *Jan.*, 1942.—The polymer of methyl isopropenyl ketone is shown to have a "head to tail" type of structure.

See Abstr. 3047 541.61 : 535.343

3137 541.64

Copolymerization of alkyl acrylates and alkyl methacrylates. Some kinetic studies on copolymerization. MARVEL, C. S., AND FRANK, R. L. *J. Amer. Chem. Soc.*, 64, *pp.* 1675–1678, *July*, 1942.—Preliminary kinetic studies on mixtures of ethyl acrylate and monomenthyl maleate and of ethyl maleate and menthyl acrylate are recorded. Evidence that monomenthyl maleate reacts with benzoyl peroxide to give a non-polymeric product is given.

3138 541.651 : 535.343

Structure and absorption spectra. III. Normal conjugated dienes. WOODWARD, R. B. *J. Amer. Chem. Soc.*, 64, *pp.* 72–75, *Jan.*, 1942.—By the use of simple substitutive and positional shifts it is possible to calculate with reasonable accuracy the position of the band max. in the absorption spectra of normal conjugated dienes. The use of these generalizations in structure determinations is exemplified, and certain analogies between the diene chromophore and the α,β-unsaturated ketone chromophore are pointed out.

3139 541.651 : 535.343

Structure and absorption spectra. IV. Further observations on α,β-unsaturated ketones. WOODWARD, R. B. *J. Amer. Chem. Soc.*, 64, *pp.* 76–77, *Jan.*, 1942.—The effect of exocyclic double bonds in determining the position of the band max. for the intense band in the absorption spectra of α,β-unsaturated ketones is demonstrated. The recognition of the new effect permits certain refinements in the classification system previously proposed.

See Abstr. 3084 541.651 : 535.343 : 539.132

See Abstr. 3083 541.651 : 539.132

3140 541.653

The effect of temperature on the validity of Hudson's rules of isorotation. KAUZMANN, W. *J. Amer. Chem. Soc.*, 64, *pp.* 1626–1629, *July*, 1942.—It is shown from theoretical considerations that the clue to the discrepancies observed on the application of Hudson's rules of isorotation to the calculation of the optical rotations of carbohydrates is to be found in the temperature variation of the optical rotation for these compounds. Experimental measurements support the prediction that, as the temperature is increased, the rules should become more accurate.

3141 541.653

Studies on the dependence of optical rotatory power on chemical constitution. XIX. Stereoisomeric aminoanilino-, and dimethylaminoanilino-, methylenecamphors, and their derivatives. SINGH, B. K., AND BHADURI, B. *Proc. Indian Acad. Sci.*, 15, *pp.* 281–292, *April*, 1942.—The optical rotatory dispersion of the condensation products of oxymethylenecamphors (*d, l, dl*) with aminoacetanilides (*o, m, p*) and with *p*-aminodimethylaniline was determined. The products of hydrolysis of these acetylated compounds afford an opportunity to study the effect of substitution on rotatory power of a free amino group in the benzene nucleus at different positions.

See Abstr. 3063 541.66 : 536.662

3142 541.67 : 538.22

Influence of the hydrogen bond on magnetic susceptibility. VENKATARAMIAH, H. S. *J. Mysore Univ. B*, 3, 4, *pp.* 19–22, 1942.—The effect on magnetic susceptibility χ of (*a*) the breaking up of the H bonds by dissolving various alcohols in CCl_4 and of (*b*) the association between unlike molecules through H bonding when $CHCl_3$ is dissolved in a donor solvent like ether is investigated. Results indicate that the χ of the solutions in CCl_4 is higher than the calculated value, the enhancement being ascribed to the breaking up in solution of the H bonds responsible for the association of alcohol molecules in the pure liquid. In the mixture of $CHCl_3$ and ether the observed χ is less than the calculated value, and the drop is attributed to the association of the unlike molecules in solution. It is concluded that the association of molecules due to formation of a H bond always brings about a depression in their diamagnetism. N. M. B.

3143 541.8

The solubility of lead sulphate and of lead oxalate in various media. KOLTHOFF, I. M., PERLICH, R. W., AND WEIBLEN, D. *J. Phys. Chem.*, 46, *pp.* 561–570, *May*, 1942.—Dithizone is a suitable reagent for the determination of the solubility of slightly soluble Pb salts in various media. The solubilities of $PbSO_4$ in aq. solutions of Na_2SO_4 and H_2SO_4 agree with data reported by others. The effect of the ionic strength of $NaNO_3$ upon the solubility of $PbSO_4$ in 0·01 *M* is very large. Alcohol decreases the solubility of $PbSO_4$. The solubility was determined in water-ethanol mixtures with an alcohol content up to 70%. The solubility product of lead oxalate in water was 5×10^{-10}. The solubility of Pb oxalate was determined in water-ethanol mixtures with an alcohol content up to 30%. The solubility of $PbCrO_4$ in water was 5×10^{-7} mole/l.

3144 541.8

Residue volume method of solubility determination. VAUGHN, T. H., AND NUTTING, JR., E. G. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 454–456, *June* 15, 1942.—A method of determining solubility by measuring the vol. of residues left by mixtures of solute and solvent has proved successful where speed of determination with reasonable precision and simplicity is required. The method is useful on commercial mixtures and on substances containing insoluble impurities.

3145 541.8

Theory of solutions of high polymers. HUGGINS, M. L. *J. Amer. Chem. Soc.*, 64, *pp.* 1712–1719, *July*, 1942.—Theoretical equations derived for the activities of the components of a solution of chain molecules in a small-molecule solvent are in good agreement with experimental v.p., osm.p., swell.p. and solubility measurements. A single const., partly due to the heat of mixing, must be evaluated empirically.

3146 541.8 = 3

On the theory of nucleus formation in solutions. NEUMANN, K., AND MIESS, A. *Ann. Phys., Lpz.*, 41, 4,

pp. 319–323, 1942.—The results obtained [Abstr. 1410 (1941)] on nucleus formation in supersaturated solutions are discussed. Their disagreement with the general laws of nucleus formation is stated to be erroneous and primarily due to a misinterpretation of the "nucleus" concept. H. G. S.

3147 541.8 : 535.434

Solubility of carcinogenic and related hydrocarbons in water. DAVIS, W. W., KRAHL, M. E., AND CLOWES, G. H. A. *J. Amer. Chem. Soc.*, 64, *pp.* 108–110, *Jan.*, 1942.—By means of the nephelometric method [Abstr. 3052 (1942)] the approx. solubilities of 31 polycyclic hydrocarbons in pure water were measured at 27°.

See Abstr. 3052 541.8 : 535.434

CRYSTALLOGRAPHY

See Abstr. 3074 548 : 535.4 : 537.531

See Abstr. 2961 548 : 537.531 : 535.3 : 513.734.6

See Abstr. 3133 548.5 : 541.182.63

3148 548.73

The crystal structure of *trans-trans*-methyl fumarate and *trans-trans*-methyl muconate. KNAGGS, I. E., AND LONSDALE, K. *J. Chem. Soc.*, *pp.* 417–418, *July*, 1942.—The two esters have been examined by X-ray (including "diffuse-spot") photographic methods and found to crystallize in the triclinic system, with 1 mol. per unit cell in each case. The structures are similar, the centrosymmetrical molecules being nearly plane, and arranged parallel to (100), in chains whose length is near the long diagonal of that crystal plane. The general structure has been confirmed by optical observations on the muconate (which is positively birefringent) and by detailed measurements of the magnetic anisotropies of both compounds. The latter are typical of relatively long-chain conjugated molecules.

GEOPHYSICS

3149 550.389

Notes on isomagnetic charts: VII. Mathematical notes on isoporic charts and their singular points. VIII. The mutual consistency of the declination and horizontal-intensity isoporic charts. CHAPMAN, S. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 115–146, *June*, 1942.—The nature of the isoporic lines is examined for the magnetic potential V and for the magnetic elements D, H, I, Z and F. The isopors for V, D, H, I, Z and F for the field of a varying centred dipole are determined and illustrated. In the region around an associated pair of local dip-poles the isopors must be very complicated. The isopors near the principal geomagnetic dip-poles are discussed, and it is shown that in these regions certain isoporic charts appear to be inconsistent with theory. The isoporic charts for 1922 for D and H given by the Admiralty and by H. W. Fisk are compared and discussed. The rate of change of the vertical component of the earth-air electric current density i is expressed in terms of the surface gradients of the rates of change of the horizontal magnetic elements X and Y or D and H the formulae enable di/dt to be calculated from the distribution of the isomagnetic and isoporic lines for these elements. It is shown that, if the directions and spacing of the isoporic lines are seriously uncertain, di/dt should be found, from the magnetic charts, to have a value of order 5 mA/km.^{2}/year; this is confirmed by calculations based on the Admiralty charts for 1922, the Fisk isoporic charts for the same epoch and the Swedish magnetic surveys of epochs 1929.5 and 1936.5. The actual value of di/dt is inferred, from atmospheric-electric observations, to be at most 10^{-4}.

3150 550.835

Gamma-ray well logging in Trinidad. CONKLIN, G. M. *J. Inst. Petrol.*, 28, *pp.* 141–145, *July*, and *pp.* 172–175, *Aug.*, 1942.—Details are given of the depth measurements and the γ-ray log. In Trinidad, in many cases, the oil-sands show more deflection on the log than water-sands, due to the smaller porosity or greater amounts of clay in the oil-sand or to the oil being more radioactive. Shallow holes can also be logged by this method for surface geological study and more information can be obtained by this technique than any other because in many instances radioactive horizons are much more continuous than fossils or porosity values. R. S. R.

3151 551.508.71 : 631,317.39

A study of the electric hygrometer. EVANS, R. N., AND DAVENPORT, J. E. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 507–510, *June* 15, 1942.—[Abstr. 1647 B (1942)].

3152 551.524.36

The frequency-distribution through the year of abnormally high and low daily mean temperatures at Toronto. LONGLEY, R. W. *J. Roy. Astr. Soc. Can.*, 36, *pp.* 225–236, *July–Aug.*, 1942.—An analysis of the mean temperatures at Toronto 1841–1940, undertaken to discover the frequency of abnormally low and abnormally high mean temperatures. Tables giving these frequencies by months and by 5-day periods are presented, and the results are compared with those for Greenwich, England. Toronto had slightly more than twice as many days 10 deg. F. or more away from normal than Greenwich had. But the increase in the number of days 20 deg. or more from normal was 35-fold. The std. deviation of daily mean temperatures is almost twice as great in winter as in summer. The change to and from increased variability during the winter months is not gradual, but takes place relatively suddenly during the last half of November and the middle weeks of March.

VARIOUS SUBJECTS

See Abstr. 3053 667.2 : 535.682

See Abstr. 3062 669.3 : 536.65

See Abstr. 3102 677.3 : 531.71 : 539.216.1

See Abstr. 3099 677.46 : 539.216

See Abstr. 3055 771.35 : 535.81

See Abstr. 3017 788.1 : 534.141.4

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